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NF551: AUTOIMS

AUTOIMS is an automated procedure that creates a Master File and FOCPSB for an IMS data source. This procedure operates in three phases:

- In the first phase, AUTOIMS extracts segment and key field information from an IMS DBD and PSB you use to access the data source. This phase creates a basic Master File that contains segment information and descriptions of key fields and search fields.
- In the next phase, AUTOIMS extracts detailed field information from a COBOL FD for each segment. The accuracy of the Master File created by the AUTOIMS procedure depends on having a working, syntactically correct COBOL FD for *every segment listed in the DBD of the IMS data source*.
- In the last phase, AUTOIMS merges the results from the first two phases to create the final Master File and the FOCPSB.

For a detailed description of the Master File and FOCPSB, see your documentation on the IMS/DB Data Adapter. For detailed information about the COBOL FD Translator, see the *COBOL FD Translator for S/390 User's Manual and Installation Guide*.

AUTOIMS Prerequisites

Before you can execute the AUTOIMS procedure, the following prerequisites must be met:

- The COBOL FD Translator, Release 3.0 or higher must be installed and operational.

- IMS Version 6 or higher must be installed and operational, and the DBDLIB and PSBLIB must contain appropriate DBDs and PSBs for the IMS data sources.
- Any supported release of FOCUS for S/390 on MVS or OS/390 must be installed and operational.
- You must have MASTER and FOCPSB data sets to receive the created Master File and FOCPSB members.

Installing AUTOIMS

AUTOIMS is installed during FOCUS installation. No additional installation steps are needed.

Invoking AUTOIMS

AUTOIMS can only be invoked interactively in a FOCUS session. The CLIST that starts the session must allocate the following ddnames:

DDNAME	Allocated to the...
FOCLIB	FOCUS product load library.
USERLIB	COBOL FD Translator load library.
MASTER	PDS that contains Master Files.
FOCEXEC	PDS that contains stored procedures.
ERRORS	PDS that contains Information Builders error messages.

TRF	PDS that contains windows displayed by AUTOIMS that list and let you select members to use in the AUTOIMS procedure.
HOLDMAST	PDS that contains HOLD Master Files.

Example Editing the Sample CLIST for AUTOIMS

Edit the following CLIST to conform to your site's standards before executing it:

```
PROC 0  CONTROL NOLIST NOMSG NOFLUSH NOSYM END(ENDO)
ALLOC F(FOCLIB)  DA('prefix.FOCLIB.LOAD') SHR REUSE
ALLOC F(USERLIB) DA('prefix.CTF30.LOAD' +
                    'prefix.FUSELIB.LOAD') SHR REUSE
ALLOC F(MASTER)  DA('prefix.MASTER.DATA')  SHR REUSE
ALLOC F(FOCEXEC) DA('prefix.FOCEXEC.DATA') SHR REUSE
ALLOC F(ERRORS)  DA('prefix.ERRORS.DATA')  SHR REUSE
ALLOC F(TRF)      DA('prefix.FOCEXEC.DATA') SHR REUSE
ALLOC F(HOLDMAST) DA('user.HOLDMAST.DATA') SHR REUSE
CALL 'prefix.FOCLIB.LOAD(FOCUS)'
EXIT
```

where:

prefix

Is the high-level qualifier for your site's FOCUS production data sets.

user

Is the high-level qualifier for the HOLDMAST data set. You must have authority to create new members in this data set.

Note: You are also required to have authority to create members in the data sets that will receive the Master Files and FOCPSBs created by AUTOIMS. You enter the names of these data sets on the first window displayed by AUTOIMS.

Procedure How to Start the AUTOIMS Procedure and Log the Parameters

1. From the FOCUS prompt, issue the following command:

EX AUTOIMS

The AUTOIMS Main Menu displays:

Main Menu Master File Generation Facility for IMS

```
PSB Name           =>
PSBLIB   Dataset   =>  IMS.V6R1M0.DBT.PSBLIB
DBDLIB   Dataset   =>  IMS.V6R1M0.DBT.DBDLIB
COBOL FD Dataset   =>  PMSERH.TSO.SRCE
```

Descriptions will be members of:

```
FOCPSB Target PDS =>  PMSSAE.FOCPSB.DATA
Master Target PDS =>  PMSSAE.MASTER.DATA
Preliminary   PDS =>  PMSSAE.PRE.DATA
Translator     PDS =>  PMSSAE.TRANS.DATA
```

Parm File => PMSSAE.FOCPSB.DATA

PF 1=Help 3=Exit 4=Log 5=Members 6=TED
9=Header 10=Messages 11=Debugging 12=Audit

2. In this window, supply the name of the PSB and data sets AUTOIMS requires.

Once the correct information is entered, you can log it to a file so that it will display automatically in subsequent executions of AUTOIMS.

3. Press Enter to proceed. AUTOIMS displays a message to indicate that it is processing your menu selections.

Reference Required Data Set Names for AUTOIMS

AUTOIMS requires the following data sets:

- The PSBLIB. By default, AUTOIMS supplies the name *userid*.PSBLIB.DATA, where *userid* is your user ID.
- The DBDLIB. By default, AUTOIMS supplies the name *userid*.DBDLIB.DATA, where *userid* is your user ID.
- The data set that contains the COBOL FDs. Each COBOL FD that will be used in generating a Master File must be stored as a member in this PDS. Each COBOL FD can have only one 01 level entry.
- The data set that will contain the FOCPSBs created by AUTOIMS. By default, AUTOIMS supplies the name *userid*.FOCPSB.DATA, where *userid* is your user ID. You must have authority to create new members in this data set.
- The data set that will contain the Master Files created by AUTOIMS. By default, AUTOIMS supplies the name *userid*.MASTER.DATA, where *userid* is your user ID. You must have authority to create new members in this data set.
- The preliminary Master File library. This transitional work library receives the output of phase one of AUTOIMS processing and is useful for troubleshooting.

- The Translator library. This transitional work library receives the output of phase two of AUTOIMS processing and is useful for troubleshooting.

If the default data set names are not the ones you need, type the correct names over them.

Procedure How to Select the PSB Name

If you know the PSB name you want AUTOIMS to use, you can enter it directly in the window.

You can also select the PSB name from the PSBLIB:

- With the cursor on the PSB name line of the AUTOIMS Main Menu, press PF5. The Member List window displays:

Main Menu Master File Generation Facility for IMS

```
PSB Name          =>
PSBLIB   Dataset  => IMS.V6R1M0.DBT.PSBLIB
DBDLIB   Dataset  => IMS.V6R1M0.DBT.DBDLIB
COBOL FD Dataset  => PMSERH.TSO.SRCE
```

Descriptions will be members of:

```
FOCPSB Target PDS => PMSSAE.FOCPSB.DATA
MASTER Target PDS => PMSSAE.MASTER.DATA
PRELIMINARY   PDS => PMSSAE.PRE.DATA
TRANSLATOR    PDS => PMSSAE.TRANS.DATA
```

Member DSN=> IMS.V6R1M0.DBT.PSBLIB

Parm File => PMSSAE.FOCPSB.DATA

PF 1=Help 3=Exit 4=Log

Member List
AIHDPSPB
AIRPSB
AIR2PSB
ALLPSB
BELLPSB1
BIGPSB31
BIG31L
BMHPSB
B1001047
CARIMSLD
CARIMSRD
CARIMSWR
CARLOAD
CARPSB
CARREAD
CARREED
(MORE)

2. Page down until the cursor is under the PSB you need, and press Enter.
The PSB is entered on the PSB name line:

Main Menu Master File Generation Facility for IMS

```
PSB Name           => DI21PSB
PSBLIB   Dataset   => IMS.V6R1M0.DBT.PSBLIB
DBDLIB   Dataset   => IMS.V6R1M0.DBT.DBDLIB
COBOL FD Dataset   => PMSERH.TSO.SRCE
```

Descriptions will be members of:

```
FOCPSB Target PDS => PMSSAE.FOCPSB.DATA
Master Target PDS => PMSSAE.MASTER.DATA
Preliminary   PDS => PMSSAE.PRE.DATA
Translator     PDS => PMSSAE.TRANS.DATA
```

Parm File => PMSSAE.FOCPSB.DATA

PF 1=Help 3=Exit 4=Log 5=Members 6=TED
9=Header 10=Messages 11=Debugging 12=Audit

You can view the member list for any of the data sets listed on the Main Menu by placing the cursor under the data set name and pressing PF5. You can then:

- Select a member and open it for editing in TED by pressing PF6.
- Close the Member List window without making a selection by pressing PF3.

Procedure How to Save Default AUTOIMS Parameters

AUTOIMS can save the data set names and the PSB name you enter on the Main Menu. In future executions these values will display as the default values on the AUTOIMS Main Menu.

- When the information you want to log is displayed on the main window, press PF4. The parameters are saved in the Parameter Log file, which is member IMS\$PRM in the FOCPSB data set. The first time you press PF4, AUTOIMS creates the log file. If you press PF4 again, AUTOIMS updates the file with the values currently displayed:

Main Menu Master File Generation Facility for IMS

```
PSB Name           => DI21PSB
PSBLIB   Dataset   => IMS.V6R1M0.DBT.PSBLIB
DBDLIB   Dataset   => IMS.V6R1M0.DBT.DBDLIB
COBOL FD Dataset   => PMSERH.TSO.SRCE
```

Descriptions will be members of:

```
FOCPSB Target PDS => PMSSAE.FOCPSB.DATA
Master Target PDS => PMSSAE.MASTER.DATA
Preliminary  PDS => PMSSAE.PRE.DATA
Translator   PDS => PMSSAE.TRANS.DATA
```

Parm File => PMSSAE.FOCPSB.DATA

*** PARMS LOGGED ***

PF 1=Help 3=Exit 4=Log 5=Members 6=TED
9=Header 10=Messages 11=Debugging 12=Audit

AUTOIMS Master File Generation Window

When all of the necessary information is displayed on the Main Menu window, press Enter. The Master File Generation window displays:

```
AUTOIMS - ENTER MFD NAME TO GENERATE A NEW MASTER
PSB   : DI21PSB                               GEN DATE: 12/09/98 08.36610
PSBLIB: IMS.V6R1M0.DBT.PSBLIB
DBDLIB: IMS.V6R1M0.DBT.DBDLIB
```

MFD NAME	TYPE	PCB#	DBD NAME	SEG NO	SEG NAME	FOCPSB	COBOL FD	ERROR/WARNING
	DB	0001	DI21PART	0001	PARTR00T	DI211229		
				0002	STANINF0	DI211229		
				0003	STOKSTAT	DI211229		
				0004	CYCCOUNT	DI211229		
				0005	BACKORDR	DI211229		

PF 1=Help 3=Exit 5=Ignore Warnings PF7=Up PF8=Down

Note that the FOCPSB name is the name from the last time you logged parameters. The FOCPSB created at the end of AUTOIMS processing will have the correct name for the IMS PSB referenced.

Procedure How to Enter Information on the AUTOIMS Master File Generation Window

1. Enter a name for the new Master File in the MFD NAME column.

2. Enter the name of the COBOL FD for each segment listed. On the following screen, the Master File name is DI210307 and the COBOL FD names are the same as the segment names. Note that it is a requirement of the COBOL FD Translator that each segment in the DBD have a separate COBOL FD:

```
AUTOIMS - ENTER MFD NAME TO GENERATE A NEW MASTER
PSB      : DI21PSB                      GEN DATE: 12/09/98 08.36610
PSBLIB: IMS.V6R1M0.DBT.PSBLIB
DBDLIB: IMS.V6R1M0.DBT.DBDLIB
```

MFD NAME	TYPE	PCB#	DBD NAME	SEG NO	SEG NAME	FOCPSB	COBOL FD	ERROR/WARNING
DI210307	DB	0001	DI21PART	0001	PARTR00T	DI211229	PARTR00T	
				0002	STANINFO	DI211229	STANINFO	
				0003	STOKSTAT	DI211229	STOKSTAT	
				0004	CYCCOUNT	DI211229	CYCCOUNT	
				0005	BACKORDR	DI211229	BACKORDR	

PF 1=Help 3=Exit 5=Ignore Warnings PF7=Up PF8=Down

3. Press Enter.

If AUTOIMS detects a problem, such as a Master File name that already exists, it places a message in the ERROR/WARNING column. In the following example, the Master File name already exists:

```
AUTOIMS - ENTER MFD NAME TO GENERATE A NEW MASTER
PSB   : DI21PSB                               GEN DATE: 12/09/98 08.36610
PSBLIB: IMS.V6R1M0.DBT.PSBLIB
DBDLIB: IMS.V6R1M0.DBT.DBDLIB
```

MFD NAME	TYPE	PCB#	DBD NAME	SEG NO	SEG NAME	F0CPSB	COBOL FD	ERROR/WARNING
-----	----	-----	-----	-----	-----	-----	-----	-----
DI210307	DB	0001	DI21PART	0001	PARTROOT	DI210307	PARTROOT	MFD EXISTS
				0002	STANINFO	DI210307	STANINFO	
				0003	STOKSTAT	DI210307	STOKSTAT	
				0004	CYCCOUNT	DI210307	CYCCOUNT	
				0005	BACKORDR	DI210307	BACKORDR	

```
PF 1=Help      3=Exit      5=Ignore Warnings      PF7=Up  PF8=Down
ERRORS FOUND:  0 .  WARNINGS ISSUED:  1 .
```

- To ignore the warning and overwrite the existing Master File, Press PF5.
- To supply a new name, type over the Master File name and press Enter.

If the PSB has more than one PCB, you must enter a Master File name for each PCB and supply COBOL FD names for each segment in all of the PCBs. If the PSB contains non-database PCBs, they will be handled automatically by AUTOIMS.

The following is an example of a PSB that contains two database PCBs:

```
AUTOIMS - ENTER MFD NAME TO GENERATE A NEW MASTER
PSB   : TEMPSB                               GEN DATE: 03/07/01 08.33610
PSBLIB: PMS.DBT.V6R1M0.PSBLIB
DBDLIB: PMS.DBT.V6R1M0.DBDLIB
```

MFD NAME	TYPE	PCB#	DBD NAME	SEG NO	SEG NAME	FOCPSB	COBOL FD	ERROR/WARNING
TEMP1	DB	0001	CARDBD	0001	ORIGIN		ORIGIN	
				0002	COMP		COMP	
				0003	CARREC		CARREC	
				0004	BODY		BODY	
				0005	SPECS		SPECS	
				0006	WARANT		WARANT	
				0007	EQUIP		EQUIP	
TEMP2	DB	0002	TACCOUNT	0001	ACMASTER		ACMASTER	
				0005	ACBLKFED		ACBLKFED	
				0014	ACMEMO		ACMEMO	

PF 1=Help 3=Exit 5=Ignore Warnings PF7=Up PF8=Down

Two Master File names are entered, and a COBOL FD name is supplied for each segment in both PCBs. Note that AUTOIMS processing time increases as the number of PCBs increases.

COBOL FD Translator Options Window

Next AUTOIMS displays the COBOL FD Translator Options window:

```
COBOL FD Translator - Version 3.0.2
COBOL FD Dataset Name => PMSERH.TSO.SRCE

MFD Dataset Name => PMSSAE.MASTER.DATA

Field Name Length      => 30      (12,30)
Skip 'n' Hyphens in COBOL Name => 0      (0,1,2,3)
Remove Hyphens or Use Underbars=> U      (Remove,Underbars)
Generate GROUP Fields  => A      (All,None,Printable only)
Generate REDEFINE Fields => C      (Comments,None,Segments)
Generate LEVEL 88 as Comments => N      (Yes,No)
Describe Occurs as Segments => Y      (Yes,No)
Zoned Numeric Field Usage => A      (Packed,Alpha)
Numeric Field Edit Options =>      (S,C,B,R,M,N,L combinations)

1=Help      2=Read Me      3=Top
```

In many cases the default options are sufficient. However, some situations require changes to these defaults. For a detailed discussion of the options, refer to the *COBOL FD Translator for S/390 User's Manual and Installation Guide*.

When you press Enter, AUTOIMS displays a message indicating that it is processing your request.

Completing AUTOIMS Processing

The Main Menu displays with a completion message when AUTOIMS finishes processing:

Main Menu Master File Generation Facility for IMS

```
PSB Name           => DI21PSB
PSBLIB   Dataset   => IMS.V6R1M0.DBT.PSBLIB
DBDLIB   Dataset   => IMS.V6R1M0.DBT.DBDLIB
COBOL FD Dataset   => PMSERH.TSO.SRCE
```

Descriptions will be members of:

```
FOCPSB Target PDS => PMSSAE.FOCPSB.DATA
Master Target PDS => PMSSAE.MASTER.DATA
Preliminary   PDS => PMSSAE.PRE.DATA
Translator     PDS => PMSSAE.TRANS.DATA
```

Parm File => PMSSAE.FOCPSB.DATA

Processing complete

PF 1=Help 3=Exit 4=Log 5=Members 6=TED
9=Header 10=Messages 11=Debugging 12=Audit

Reference AUTOIMS Main Menu PF Keys

Several PF key actions are available from the Main Menu:

PF Key	Action
PF1	Displays a help file.
PF3	Exits from the active window.
PF4	Updates the parameter log file with the names entered on the Main Menu.
PF5	Opens a Member List window for the selected data set.
PF6	Opens a member from the Member List window for editing or viewing in TED.
PF9	Opens the file that contains the parameter list passed by AUTOIMS to the COBOL FD Translator.
PF12	Displays a report about the Master File creation process, including detailed descriptions of the fields inserted.

Note that PF10 and PF11 are used by the COBOL FD Translator and do not supply useful information regarding AUTOIMS.

Accessing the Generated Master File and FOCPSB

You can list data set members and open them in TED directly from the AUTOIMS Main Menu.

Procedure How to Access the Generated Master File and FOCPSB

1. Place the cursor under the name of the data set whose members you want to list and press PF5. The Member List window displays. It lists the members of the Master Target data set:

Main Menu Master File Generation Facility for IMS

PSB Name => DI21PSB
PSBLIB Dataset => IMS.V6R1M0.DBT.PSBLIB
DBDLIB Dataset => IMS.V6R1M0.DBT.DBDLIB
COBOL FD Dataset => PMSERH.TSO.SRCE

Descriptions will be members of:

FOCPSB Target PDS => PMSSAE.FOCPSB.DATA
MASTER Target PDS => PMSSAE.MASTER.DATA
PRELIMINARY PDS => PMSSAE.PRE.DATA
TRANSLATOR PDS => PMSSAE.TRANS.DATA

Member DSN=> PMSSAE.MASTER.DATA

Parm File => PMSSAE.FOCPSB.DATA

PF 1=Help 3=Exit 4=Log

6=TED 9=TED New

Member List
(MORE)
DATETIM2
DB2CAT
DB2SYSTB
DEDUCT
DEPTMP
DI21MFD
DI21PART
DI210307
DI211220
DI211227
DI211229
DTTRANS
ECOURSE
EDUCFILE
EEDUC
EEMP1
(MORE)

2. To open a member in TED, place the cursor under the member name and press PF6.

The following example shows the Master File just created by AUTOIMS, member DI210307 in the Master Target PDS:

```
$$$ CREATED BY AUTOIMS ON 03/07/01 AT 15.29.22 BY PMSSAE
$$$ FROM PSB : DI21PSB   DBD: DI21PART GEN DATE: 12/09/98 08.36610
$$$ IN PSBLIB: IMS.V6R1M0.DBT.PSBLIB
$$$ IN DBDLIB: IMS.V6R1M0.DBT.DBDLIB
FILENAME=DI211229,SUFFIX=IMS,$
  SEGNAME=PARTROOT,SEGTYPE=S2,PARENT=      , $
    GROUP=PARTROOT_IO                      ,ALIAS=      ,A50
,A050,$
  FIELD=PARTKEY                            ,ALIAS=PARTKEY.KEY ,A17
,A017,$
  FIELD=FILLER                             ,ALIAS=      ,A33
,A033,$
  SEGNAME=STANINFO,SEGTYPE=S2,PARENT=PARTROOT,$
    GROUP=STANINFO_IO                      ,ALIAS=      ,A85
,A085,$
  FIELD=STANKEY                            ,ALIAS=STANKEY.KEY ,A2
,A002,$
  FIELD=FILLER                             ,ALIAS=      ,A83
,A083,$
  SEGNAME=STOKSTAT,SEGTYPE=S2,PARENT=PARTROOT,$
```

```
      GROUP=STOKSTAT_IO                      ,ALIAS=                      ,A140
,A140,$
      FIELD=STOCKEY                          ,ALIAS=STOCKEY.KEY ,A16
,A016,$
      FIELD=FILLER                          ,ALIAS=                      ,A124
,A124,$
      SEGNAME=CYCCOUNT ,SEGTYPE=S2 ,PARENT=STOKSTAT , $
      GROUP=CYCCOUNT_IO                      ,ALIAS=                      ,A25
,A025,$
      FIELD=CYCKEY                          ,ALIAS=CYCKEY.KEY ,A2
,A002,$
      FIELD=FILLER                          ,ALIAS=                      ,A23
,A023,$
      SEGNAME=BACKORDR ,SEGTYPE=S2 ,PARENT=STOKSTAT , $
      GROUP=BACKORDR_IO                     ,ALIAS=                      ,A75
,A075,$
      FIELD=BACKKEY                          ,ALIAS=BACKKEY.KEY ,A10
,A010,$
      FIELD=FILLER                          ,ALIAS=                      ,A65
,A065,$
```

The following example shows the FOCPSB just created by AUTOIMS, member DI21PSB in the FOCPSB Target PDS. Note that the name of the FOCPSB is the same as the name of the PSB, and the PCBNAME attribute supplies the name of the Master File:

```
FOCPSB=EXTENDED , $                      PSBNAME=DI21PSB
PCBNAME=DI210307 ,PCBTYPE=DB , $ 0001 DI21PART
```

Warning: Comments (lines starting with the dollar sign) are not supported in the FOCPSB.

You can edit the file if necessary:

- To close it without editing, press PF3.

- To close it and save any edits you made, type FILE on the command line and press Enter.

To close the Member List window, press PF3.

Procedure How to Create a New Member from the AUTOIMS Main Menu

1. With the member list for one of the main menu data sets open, press PF9. The following window displays:

Main Menu Master File Generation Facility for IMS

```
PSB Name           => DI21PSB
PSBLIB   Dataset   => IMS.V6R1M0.DBT.PSBLIB
DBDLIB   Dataset   => IMS.V6R1M0.DBT.DBDLIB
COBOL FD Dataset   => PMSERH.TSO.SRCE
```

Descriptions will be members of:

```
FOCPSB Target PDS => PMSSAE.FOCPSB.DATA
Master Target PDS => PMSSAE.MASTER.DATA
Preliminary  PDS => PMSSAE.PRE.DATA
Translator   PDS => PMSSAE.TRANS.DATA
```

Enter Member Name =>

Parm File => PMSSAE.FOCPSB.DATA

PF 1=Help 3=Return 4= 5= 6=

2. Enter a name for the new member and press Enter.

Generated Master File

In the generated Master File:

- The FILENAME value is the name of the Master File.
- The SUFFIX is IMS.
- The segment names are the segment names from the IMS PSB.
- The group names are the level 01 names from the COBOL FD.
- Key field and search field names are taken from the IMS PSB; these are the only fields that have ALIAS values in the generated Master File. Names for other fields are taken from the COBOL FD.
- Format conversions are described in the *COBOL FD Translator for S/390 User's Manual and Installation Guide*.

Reference Using the Generated Master File

You may need to manually edit the generated Master File in the following situations:

- There are more than 64 segments (because of REDEFINES and OCCURS segments).
- There are multiple record types. You need to identify the RECTYPE field and the associated values.
- There are OCCURS segments and you want to add the ORDER field to the description.
- You want to add ALIAS values to fields that are not key or search fields.
- There are embedded REDEFINES declarations.
- To edit date formats and format options.

NF646: WHERE-Based JOIN

The WHERE-based (conditional) join facility gives you the flexibility to define a join based on any condition, not just equality between field values. In addition, the host and cross-referenced join fields do not require matching formats and the cross-referenced field does not need to be indexed.

Note: If your join is based on equality, it is more efficient to use the traditional equi-join.

You can specify a conditional JOIN at the command level, in a procedure, or in a Master File. If you define the join in a Master File, only the specific segment named in the Master File participates in the join, but if you issue a dynamic JOIN command, the entire cross-referenced data source participates in the join.

The conditional JOIN command supports FOCUS data sources and relational, VSAM, fixed-format sequential, relational, Adabas, and IMS data sources. Because each data source differs in its ability to handle complex WHERE criteria, the optimization of the WHERE-based JOIN syntax differs depending on the specific data sources involved in the join and the complexity of the WHERE criteria.

Conditional joins in the Master File are supported for relational data sources only. The conditions are considered virtual fields in the Master File.

Syntax How to Issue a Conditional JOIN Command

```
JOIN FILE from_file AT from_field [TAG from_tag] [WITH fieldname]  
    TO [ALL|ONE]  
    FILE to_file AT to_field [TAG to_tag]  
    [AS as_name]  
    [WHERE expression1 ;  
    WHERE expression2 ;  
    ... ; ]  
END
```

where:

from_file

Is the host Master File.

from_field

Is the field name in the host Master File whose segment will be joined to the cross-referenced data source. It can be any field in the segment. It must reside in the lowest level segment that will be referenced.

from_tag

Is the optional tag name that is used as a unique qualifier for fields and aliases in the host data source.

fieldname

Is a real field name used to assign a segment location for a virtual field. Required when issuing a DEFINE field-based WHERE-based JOIN.

ALL

Describes a one-to-many relationship between the *from_file* and *to_file*.

ONE

Describes a one-to-one relationship between the *from_file* and *to_file*. **Note:** If you specify a unique join when the relationship between the host and cross-referenced files is one-to-many, the results will be unpredictable.

to_file

Is the cross-referenced Master File.

to_field

Is the join field name in the cross-referenced Master File. It can be any field in the segment.

to_tag

Is the optional tag name that is used as a unique qualifier for fields and aliases in the cross-referenced data source.

as_name

Is the name associated with the JOIN.

expression1, *expression2*

Are any expressions valid in a DEFINE FILE command. All of the fields used in all of the expressions the expressions must lie on a single path.

Note: Single line JOIN syntax is not supported. The END command is required.

Example Using the WHERE-based JOIN Command

The following example joins the MOVIES and VIDEOTRK data sources on the conditions that:

- The transaction date (in VIDEOTRK) is more than ten years after the release date (in MOVIES).
- The movie codes match in both data sources.

The join is performed at the segment that contains MOVIECODE in the VIDEOTRK data source because the join must occur at the lowest segment referenced.

The following request displays the title, most recent transaction date, and release date for each movie in the join and computes the number of years between this transaction date and the release date:

```
JOIN FILE VIDEOTRK AT FEE      TAG V1 TO ALL
      FILE MOVIES   AT RELDATE TAG M1  AS JW1
      WHERE DATEDIF(RELDATE , TRANSDATE,'Y') GT 10  ;
      WHERE V1.MOVIECODE EQ M1.MOVIECODE;
END
TABLE FILE VIDEOTRK
      SUM TITLE/A25 AS 'Title'
      TRANSDATE AS 'Last,Transaction'
      RELDATE AS 'Release,Date'
      COMPUTE YEARS/I5 = (TRANSDATE - RELDATE)/365;  AS 'Years,Difference'
      BY TITLE NOPRINT
      BY HIGHEST 1 TRANSDATE NOPRINT
END
```

The output is:

Title	Last Transaction	Release Date	Years Difference
-----	-----	-----	-----
ALICE IN WONDERLAND	91/06/22	51/07/21	39
ALIEN	91/06/18	80/04/04	11
ALL THAT JAZZ	91/06/25	80/05/11	11
ANNIE HALL	91/06/24	78/04/16	13
BAMBI	91/06/22	42/07/03	49
BIRDS, THE	91/06/23	63/09/27	27
CABARET	91/06/25	73/07/14	17
CASABLANCA	91/06/27	42/03/28	49
CITIZEN KANE	91/06/22	41/08/11	49
CYRANO DE BERGERAC	91/06/20	50/11/09	40
DEATH IN VENICE	91/06/26	73/07/27	17
DOG DAY AFTERNOON	91/06/23	76/04/04	15
EAST OF EDEN	91/06/20	55/01/12	36
GONE WITH THE WIND	91/06/24	39/06/04	52
JAWS	91/06/27	78/05/13	13
MALTESE FALCON, THE	91/06/19	41/11/14	49
MARTY	91/06/19	55/10/26	35
NORTH BY NORTHWEST	91/06/21	59/02/09	32
ON THE WATERFRONT	91/06/24	54/07/06	36
PHILADELPHIA STORY, THE	91/06/21	40/05/06	51
PSYCHO	91/06/17	60/05/16	31
REAR WINDOW	91/06/17	54/12/15	36
SHAGGY DOG, THE	91/06/25	59/01/09	32
SLEEPING BEAUTY	91/06/24	75/08/30	15
TIN DRUM, THE	91/06/17	80/03/01	11
VERTIGO	91/06/27	58/11/25	32

Syntax How to Define a Conditional Join in the Master File

```
SEGNAME=seg,  SEGTYPE=styp,  PARENT=parseg,  
            CRFILE=xmfd,  [CRSEG=xseg,  ]  
            JOIN_WHERE=expression; [JOIN_WHERE=expression; ...] , $
```

where:

seg

Is the segment name for the joined segment.

styp

Is the segment type for the joined segment. Can be DKU, DKM, KU, or KM as with traditional cross-references in the Master File. **Note:** If you specify a unique join when the relationship between the host and cross-referenced files is one-to-many, the results will be unpredictable.

parseg

Is the parent segment name.

xmfd

Is the cross-referenced Master File.

xseg

Is the cross-referenced segment, if *seg* is not the same name as the SEGNAME in the cross-referenced Master File.

expression

Is any expression valid in a DEFINE FILE command. All of the fields referenced in all of the expressions must lie on a single path.

Example Conditionally Joining Two DB2 Data Sources in a Master File

The following Master File for the EMPINFO table contains a conditional join to the PAYINFO table. The conditions specify that the job code starts with the letter A and the employee IDs are equal in the two tables:

```
FILENAME=EMPINFO ,SUFFIX=SQLDS,$

SEGNAME=EMPINFO ,SEGTYPE=S0,$
FIELD=EMP_ID ,ALIAS=EID ,USAGE=A9 ,ACTUAL=A9 ,,$
FIELD=LAST_NAME ,ALIAS=LN ,USAGE=A15 ,ACTUAL=A15 ,,$
FIELD=FIRST_NAME ,ALIAS=FN ,USAGE=A10 ,ACTUAL=A10 ,,$
FIELD=HIRE_DATE ,ALIAS=HDT ,USAGE=YMD ,ACTUAL=DATE ,,$
FIELD=DEPARTMENT ,ALIAS=DPT ,USAGE=A10 ,ACTUAL=A10 ,
MISSING=ON,$
FIELD=CURRENT_SALARY,ALIAS=CSAL ,USAGE=P9.2 ,ACTUAL=P4 ,,$
FIELD=CURR_JOBCODE ,ALIAS=CJC ,USAGE=A3 ,ACTUAL=A3 ,,$
FIELD=ED_HRS ,ALIAS=OJT ,USAGE=F6.2 ,ACTUAL=F4 ,
MISSING=ON,$
FIELD=BONUS_PLAN ,ALIAS=BONUS_PLAN ,USAGE=I4 ,ACTUAL=I4 ,,$
FIELD=HIRE_DATE_TIME,ALIAS=HDTT ,USAGE=HYMDm ,ACTUAL=HYMDm ,,$
FIELD=HIRE_TIME ,ALIAS=HT ,USAGE=HHIS ,ACTUAL=HHIS ,,$

SEGNAME=PAYINFO, SEGTYPE=KM, PARENT = EMPINFO,
CRFILE = PAYINFO,
JOIN_WHERE = JOBCODE LIKE 'A%';
JOIN_WHERE = EMP_ID EQ PAYEID; ,,$
```

The EMPINFO Access File follows:

```
SEGNAME = EMPINFO, TABLENAME = "USER1"."EMPINFO", KEYS = 1, WRITE = YES,
DBSPACE = PMSDB.PMSTSP1 ,,$
```

The PAYINFO Access File follows:

```
SEGNAME = PAYINFO, TABLENAME = "USER1"."PAYINFO", KEYS = 2,  
      WRITE=YES, DBSPACE = PMSDB.PMSTSP1,$
```

The following request prints fields from both tables:

```
TABLE FILE EMPINFO  
PRINT SALARY JOBCODE  
BY LAST_NAME BY FIRST_NAME  
END
```

The output is:

LAST_NAME	FIRST_NAME	SALARY	JOBCODE
-----	-----	-----	-----
BANNING	JOHN	\$29,700.00	A17
CROSS	BARBARA	\$27,062.00	A17
		\$25,775.00	A16
GREENSPAN	MARY	\$9,000.00	A07
IRVING	JOAN	\$24,420.00	A14
		\$26,862.00	A15
SMITH	RICHARD	\$9,500.00	A01
STEVENS	ALFRED	\$10,000.00	A07
		\$11,000.00	A07

Conditional JOIN Processing

A WHERE in a JOIN is in effect only when a TABLE request references a cross-referenced segment or its children. If the request makes no such reference, the WHERE has no effect.

The AT attribute is used to link the correct parent segment or host to the correct child or cross-referenced segment. The field names used in the AT phrases are not used to cause the link. They are simply used as segment references.

Note: If there is no WHERE in effect, the join will produce a Cartesian product. The conditional JOIN command can reference any field in the joined data source and any field in the parent segment or higher on the parent's path. When active, these JOIN expressions screen the segment they reside on (the child or joined segment). That is, if no child segment passes the expression, the JOIN follows the rules of the SET ALL command when no child segment exists. Unlike TABLE WHERE clauses, JOIN_WHERE screening does not automatically screen the parent segment when SET ALL=ON.

To issue a DEFINE-based conditional join, the KEEPDEFINES setting, described in [Preserving Virtual Fields Using the KEEPDEFINES Parameter](#), must be ON. You then must create all virtual fields before issuing the join. This differs from traditional DEFINE-based joins in which the virtual field is created after the JOIN command is issued. In addition, a virtual field can be part of the JOIN syntax or WHERE criteria.

Preserving Virtual Fields During Join Parsing

By default, a JOIN command clears all DEFINE FILE commands for the host data source and the joined structure. Two methods are available for preserving virtual fields during join parsing.

Preserving Virtual Fields Using the KEEPDEFINES Parameter

Setting KEEPDEFINES to ON reinstates virtual field definitions after the parsing of a JOIN command. With this setting, every time you issue a JOIN command, virtual field definitions that were active prior to the JOIN are saved and reactivated after the join is performed. The set of virtual fields active prior to each join is called a *context*. Each new JOIN command creates a new context for virtual field definitions.

Each new context creates a new layer or command environment. When you first enter the new environment, all of the virtual fields defined in the previous layer are available in the new layer. Overwriting or clearing a virtual field definition affects only the current layer. When you return to the previous layer, its virtual field definitions are intact.

If you redefine an active virtual field after a JOIN, its new definition replaces the prior definition within the context of the JOIN command. When the join is cleared, the old definition is re-activated. New DEFINE commands issued after the JOIN constitute a new context. In each context, all virtual fields of all prior contexts are accessible. In this way, JOIN and DEFINE commands create a stack of contexts.

Clearing a join by issuing the JOIN CLEAR *join_name* command removes all of the contexts that were created after the JOIN *join_name* command was issued.

Syntax How to Preserve Virtual Fields With KEEPDEFINES

```
SET KEEPDEFINES = {OFF|ON}
```

where:

OFF

Does not preserve virtual fields issued prior to a join. This is the default value

ON

Preserves virtual fields during join parsing.

Example Preserving Virtual Fields During Join Parsing With KEEPDEFINES

The first virtual field, DAYSKEPT, is defined prior to issuing any joins, but after setting KEEPDEFINES to ON. DAYSKEPT is the number of days between the return date and rental date for videotape:

```
SET KEEPDEFINES = ON
DEFINE FILE VIDEOTRK
DAYSKEPT/I5 = RETURNDATE - TRANSDATE;
END
```

The ? DEFINE query command shows that this is the only virtual field defined at this point:

FILE	FIELD NAME	FORMAT	SEGMENT	VIEW	TYPE
VIDEOTRK	DAYSKEPT	I5	4		

The following request prints all transactions in which the number of days kept is two:

```
TABLE FILE VIDEOTRK
PRINT MOVIECODE TRANSDATE RETURNDATE DAYSKEPT
WHERE DAYSKEPT EQ 2
END
```

The first few lines of output show that each return date is two days after the transaction date:

MOVIECODE	TRANSDATE	RETURNDATE	DAYSKEPT	ACTUAL_DAYS
-----	-----	-----	-----	-----
001MCA	91/06/27	91/06/29	2	2
692PAR	91/06/27	91/06/29	2	2
259MGM	91/06/19	91/06/21	2	2

Now, the VIDEOTRK data source is joined to the MOVIES data source. The ? DEFINE query shows that the join did not clear the DAYSKEPT virtual field:

```
JOIN MOVIECODE IN VIDEOTRK TO ALL MOVIECODE IN MOVIES AS J1
? DEFINE
```

FILE	FIELD NAME	FORMAT	SEGMENT	VIEW	TYPE
VIDEOTRK	DAYSKEPT	I5	4		

Next a new virtual field, YEARS, is defined for the join between VIDEOTRK and MOVIES:

```
DEFINE FILE VIDEOTRK
YEARS/I5 = (TRANSDATE - RELEDATE)/365;
END
```

The ? DEFINE query shows that the virtual field created prior to the join was not cleared by this new virtual field because it was in a separate context:

FILE	FIELD NAME	FORMAT	SEGMENT	VIEW	TYPE
VIDEOTRK	DAYSKEPT	I5	4		
VIDEOTRK	YEARS	I5	5		

Next, the field DAYSKEPT is re-defined so that it is the actual number of days plus one:

```
DEFINE FILE VIDEOTRK
DAYSKEPT/I5 = RETURNDATE - TRANSDATE + 1;
END
```

The ? DEFINE query shows that there are two versions of the DAYSKEPT virtual field. However, YEARS was cleared because it was in the same context (after the join) as the new version of DAYSKEPT and the DEFINE command did not specify the ADD option:

FILE	FIELD NAME	FORMAT	SEGMENT	VIEW	TYPE
VIDEOTRK	DAYSKEPT	I5	4		
VIDEOTRK	DAYSKEPT	I5	4		

The same request now uses the new definition for DAYSKEPT. Note that the number of days between the return date and transaction date is actually one day, not two, because of the change in the definition of DAYSKEPT:

MOVIECODE	TRANSDATE	RETURNDATE	DAYSKEPT	ACTUAL_DAYS
-----	-----	-----	-----	-----
040ORI	91/06/20	91/06/21	2	1
505MGM	91/06/21	91/06/22	2	1
710VES	91/06/26	91/06/27	2	1

Now, J1 is cleared. The redefinition for DAYSKEPT is also cleared:

```
JOIN CLEAR J1
? DEFINE
FILE      FIELD NAME                FORMAT  SEGMENT  VIEW      TYPE
VIDEOTRK DAYSKEPT                   I5      4
```

The report output shows that the original definition for DAYSKEPT is now in effect:

MOVIECODE	TRANSDATE	RETURNDATE	DAYSKEPT	ACTUAL_DAYS
-----	-----	-----	-----	-----
001MCA	91/06/27	91/06/29	2	2
692PAR	91/06/27	91/06/29	2	2
259MGM	91/06/19	91/06/21	2	2

Preserving Virtual Fields Using DEFINE FILE SAVE and RETURN

Occasionally, new code needs to be added to an existing application. When adding code, there is always the possibility of over-writing existing virtual fields by reusing their names inadvertently.

The DEFINE FILE SAVE command forms a new context for virtual fields, which can then be removed with DEFINE FILE RETURN. Each new context creates a new layer or command environment. When you first enter the new environment, all of the virtual fields defined in the previous layer are available in the new layer. Overwriting or clearing a virtual field definition affects only the current layer. When you return to the previous layer using DEFINE FILE RETURN, its virtual field definitions are intact.

Therefore, all the virtual fields that are created in the new application can be removed before returning to the calling application, without affecting existing virtual fields in that application.

Syntax **How to Use DEFINE FILE SAVE and DEFINE FILE RETURN**

```
DEFINE FILE mfd SAVE  
fld1/format1=expression1 ;  
fld2/format2=expression2;  
END...  
TABLE FILE mfd ...  
MODIFY FILE mfd ...  
DEFINE FILE mfd RETURN  
END
```

where:

SAVE

Creates a new context for virtual fields.

mfd

Is the name of the Master File for which a new context is created.

RETURN

Clears the current context if it was created by DEFINE FILE SAVE and restores the previous context.

Note: A JOIN can be issued after a DEFINE FILE SAVE. In order to clear the join context, you must issue a JOIN CLEAR command. If only DEFINE FILE and DEFINE FILE ADD commands were issued after a DEFINE FILE SAVE, you can clear them by issuing a DEFINE FILE RETURN.

Example Preserving Virtual Fields With DEFINE FILE SAVE and RETURN

The following command enables you to preserve virtual fields within a file context:

```
SET KEEPDEFINES=ON
```

The following command defines virtual field A for the VIDEOTRK data source and places it in the current context:

```
DEFINE FILE VIDEOTRK  
  A/A5='JAWS' ;  
END
```

The following command creates a new context and saves virtual field B in this context:

```
DEFINE FILE VIDEOTRK SAVE  
  B/A5='ROCKY' ;  
END  
? DEFINE
```

The output of the ? DEFINE query lists virtual fields A and B:

FILE	FIELD NAME	FORMAT	SEGMENT	VIEW	TYPE
VIDEOTRK	A	A5			
VIDEOTRK	B	A5			

The following DEFINE command creates virtual field C. All previously defined virtual fields are cleared because the ADD option was not used in the DEFINE command:

```
DEFINE FILE VIDEOTRK
  C/A10='AIRPLANE' ;
END
? DEFINE
```

The output of the ? DEFINE query shows that C is the only virtual field defined:

FILE	FIELD NAME	FORMAT	SEGMENT	VIEW	TYPE
VIDEOTRK	C	A10			

The following JOIN command creates a new context. Because KEEPDEFINES is set to ON, virtual field C is not cleared by the JOIN command:

```
JOIN MOVIECODE IN VIDEOTRK TAG V1 TO MOVIECODE IN MOVIES TAG M1 AS J1
? DEFINE
```

The output of the ? DEFINE query shows that field C is still defined:

FILE	FIELD NAME	FORMAT	SEGMENT	VIEW	TYPE
VIDEOTRK	C	A10			

The next DEFINE command creates virtual field D in the new context created by the JOIN command:

```
DEFINE FILE VIDEOTRK SAVE
  D/A10='TOY STORY' ;
END
? DEFINE
```

The output of the ? DEFINE query shows that virtual fields C and D are defined:

FILE	FIELD NAME	FORMAT	SEGMENT	VIEW	TYPE
VIDEOTRK	C	A10			
VIDEOTRK	D	A10			

The DEFINE FILE RETURN command clears virtual field D created in the current context (after the JOIN):

```
DEFINE FILE VIDEOTRK RETURN  
? DEFINE
```

The output of the ? DEFINE query shows that virtual field D was cleared, but C is still defined:

FILE	FIELD NAME	FORMAT	SEGMENT	VIEW	TYPE
VIDEOTRK	C	A10			

The following DEFINE FILE RETURN command does not clear virtual field C because field C was not created using a DEFINE FILE SAVE command:

```
DEFINE FILE VIDEOTRK RETURN  
END  
? DEFINE
```

The output of the ? DEFINE query shows that virtual field C is still defined:

FILE	FIELD NAME	FORMAT	SEGMENT	VIEW	TYPE
VIDEOTRK	C	A10			

Note: DEFINE FILE RETURN is only activated when a DEFINE FILE SAVE is in effect.

Clearing Joins

You can clear joins by issuing the JOIN CLEAR command. The effect of the JOIN CLEAR command depends on whether any conditional joins exist:

- If no conditional joins exist, the JOIN CLEAR command clears all virtual fields defined for the host data source and the joined structure.
- If conditional joins exist but were issued prior to the join you want to clear, the JOIN CLEAR command clears only the specified join. Any virtual fields saved in the context of a join that is cleared will also be cleared.
- If conditional joins exist and were issued subsequent to the join you want to clear, or if the join you want to clear is a conditional join, the JOIN CLEAR command clears the specified join and all subsequent joins issued for the same host file.

The JOIN CLEAR * command clears every join that was issued, along with its associated virtual fields. However, virtual fields defined in the null context (prior to any joins) remain in effect.

Example Clearing Joins

The following request creates three joins using VIDEOTRK as the host data source. The first two are conditional (JW1, JW2), and the third join is unconditional (J1):

```
JOIN FILE VIDEOTRK AT PRODCODE TO ALL
      FILE GGSales  AT PCD AS JW1
WHERE PRODCODE NE PCD;
END
JOIN  FILE VIDEOTRK AT TRANSDATE TO ALL
      FILE MOVIES   AT RElDATE   AS JW1
WHERE (TRANSDATE - RElDATE)/365 GT 10;
END
JOIN MOVIECODE IN VIDEOTRK TO MOVIECODE IN MOVIES AS J1
```

The next request creates a conditional join (JW3) using MOVIES as the host data source:

```
JOIN  FILE MOVIES   AT MOVIECODE TO ONE
      FILE VIDEOTRK AT TRANSDATE AS JW2
WHERE (TRANSDATE - RElDATE)/365 LT 2;
END
```

The last request creates a third conditional join (JW4) that uses VIDEOTRK as the host data source:

```
JOIN  FILE VIDEOTRK AT LASTNAME  TO ALL
      FILE EMPLOYEE AT LAST_NAME AS JW3
WHERE LASTNAME GE LAST_NAME;
END
```

Following is the output of the ? JOIN query after executing these joins:

```
? JOIN
```

```
JOINS CURRENTLY ACTIVE
```

HOST			CROSSREFERENCE					
FIELD	FILE	TAG	FIELD	FILE	TAG	AS	ALL	WH
-----	-----	---	-----	-----	---	--	---	--
PRODCODE	VIDEOTRK		PCD	GGSales		JW1	Y	Y
TRANSDATE	VIDEOTRK		RELDATE	MOVIES		JW2	Y	Y
MOVIECODE	VIDEOTRK		MOVIECODE	MOVIES		J1	N	N
MOVIECODE	MOVIES		TRANSDATE	VIDEOTRK		JW3	N	Y
LASTNAME	VIDEOTRK		LAST_NAME	EMPLOYEE		JW4	Y	Y

Clearing JW2 clears all joins that were issued after JW2 and that use the same host data source. JW1 remains because it was issued prior to JW2, and JW3 remains because it uses a different host data source:

```
JOIN CLEAR JW2
```

```
? JOIN
```

```
JOINS CURRENTLY ACTIVE
```

HOST			CROSSREFERENCE					
FIELD	FILE	TAG	FIELD	FILE	TAG	AS	ALL	WH
-----	-----	---	-----	-----	---	--	---	--
PRODCODE	VIDEOTRK		PCD	GGSales		JW1	Y	Y
MOVIECODE	MOVIES		TRANSDATE	VIDEOTRK		JW3	N	Y

Listing JOIN Structures: The ? JOIN Query

To display a list of joined data sources, issue the following command at the FOCUS command prompt or in a stored procedure:

```
? JOIN
```

This displays every JOIN command currently in effect. The output now includes a column titled WH for WHERE-based joins:

JOINS CURRENTLY ACTIVE

HOST			CROSSREFERENCE					
FIELD	FILE	TAG	FIELD	FILE	TAG	AS	ALL	WH
-----	----	---	-----	----	---	--	----	--
TRANSDATE	VIDEOTRK		RELDATE	MOVIES		JW1	N	Y
EMP_ID	EMPLOYEE		EMP_ID	EDUCFILE		J1	Y	N

Reference Error Message

(FOC36316) WHERE-BASED JOIN FROM NON-FOCUS TO FOCUS NOT SUPPORTED

This error occurs when a non-FOCUS data source is joined to a FOCUS data source. The feature is supported in FOCUS-to-FOCUS or non-FOCUS-to-non-FOCUS data sources only.

NF767: Long Alphanumeric Fields

You can have up to 3968 bytes in an alpha field within a FOCUS or FUSION file segment. You can have up to 4095 bytes in a fixed format sequential data source. You may define the length in either the Master File, a DEFINE FILE command, or a COMPUTE command.

Long alpha fields are useful for:

- Extracting data from other DBMS's in order to load into a data warehouse.
- Handling long text without the need to use TXT fields.
- Its manipulating capabilities in EDIT, including concatenation, SUBSTR, and CONTAINS.

Example How to Use an Alpha Field Over 256 Bytes

In a Master File:

```
FILENAME=VIDEOTRK, SUFFIX=FOC  
SEGNAME=CUST,  SEGTYPE=S1,  
  FIELDNAME=CUSTID,CIN,A3860,$
```

In a DEFINE FILE:

```
DEFINE FILE VIDEOTRK  
CUSTID/A3860=...;
```

Reference Usage Notes for 4K Alpha fields

- Long alpha fields cannot be indexed.
- For FOCUS and FUSION files, a segment still has to fit on a 4K page. Thus, the maximum length of an alpha field is dependent on the length of the other fields within its segment.

NF767: Long Alphanumeric Fields

- Long alpha fields cannot be used in a CRTFORM.
- You can print or hold long alpha fields but are unable to view them online.
- Long alpha fields may be used as keys.
- Long alpha fields are not supported in Hot Screen.

NF787: Increased Report Width

The logical size of the internal (FOCSORT) sort page has been increased from approximately 4K to approximately 32K. The sort page is increased in 4K increments, as needed. This allows the width of a result in a TABLE request to approach 32K, depending on the specific request syntax.

In conjunction with the increased sort page size, the maximum number of display fields has increased to 1024 subject to the limitation that the length of all fields in the request be less than the logical sort page size. Each field generates a small amount of overhead that slightly reduces the total length available.

External sorts cannot handle keys that extend past the first 4K page of the sort record. Therefore, using FOCSORT may produce a performance improvement when the keys extend beyond 4K. In this case, FOCSORT is used even if you have EXTSORT set ON.

The increased logical sort page size applies to the TABLE and TABLEF commands. MATCH continues to operate under the previous rules.

NF788: Tiles

A report request can now group data into any number of tiles (for example, percentiles or quartiles). This enables you to answer such questions as which salesmen are in the top half of all salesmen based on total sales, or which students are in the top ten percent (decile) based on test scores.

Grouping Data in Tiles

Grouping data in tiles means sorting the data instances on a BY field in the request and then apportioning them as equally as possible into the number of tile groups you specify. Certain rules are followed when applying this process:

- A new column (labeled TILE by default) is added to the report output and displays the tile number assigned to each instance of the tile field. You can change the column heading with an AS phrase.
- Tiling is calculated within all of the higher-level sort fields in the request and restarts whenever a sort field at a higher level than the tile field changes value.
- Instances are counted using the tile field. If the request prints fields from lower level segments, there may be multiple report lines that correspond to one instance of the tile field.

- Instances with the same tile field value are placed in the same tile. For example, consider the following data, which is to be apportioned into three tiles:

1
5
5
5
8
9

In this case, dividing the instances equally produces the following:

Group	Data Values
1	1,5
2	5,5
3	8,9

However, because all of the same data values must be in the same tile, the fives that are in group 2 will be moved up to group 1. Group 2 will remain empty. The final tiles will be:

Tile Number	Data Values
1	1,5,5,5
2	
3	8,9

Syntax How to Group Data In Tiles

```
BY [ {HIGHEST|LOWEST} [k] ] tilefield [AS 'head1']  
    IN-GROUPS-OF n TILES [TOP m] [AS 'head2']
```

where:

HIGHEST

Sorts the data in descending order so that the highest data values are placed in tile 1.

LOWEST

Sorts the data in ascending order so that the lowest data values are placed in tile 1. This is the default sort order.

k

Is a positive integer representing the number of tile groups to display in the report. For example, BY HIGHEST 2 displays the two non-empty tiles with the highest data values.

tilefield

Is the field whose values are used to assign the tile numbers.

head1

Is a heading for the column that displays the values of the tile sort field.

n

Is a positive integer not greater than 32,767 specifying the number of tiles to be used in grouping the data. For example, 100 tiles produces percentiles, 10 tiles produces deciles.

m

Is a positive integer indicating the highest tile value to display in the report. For example, TOP 3 does not display any data row that is assigned a tile number greater than 3.

head2

Is a new heading for the column that displays the tile numbers.

Note:

- The syntax accepts numbers that are not integers for k , n , and m . In MVS and VM, values with decimals are rounded to integers; on UNIX and Windows NT they are truncated. If the numbers supplied are negative or zero, an error message is generated.
- Both k and m limit the number of rows displayed within each sort break in the report. If you specify both, the more restrictive value will control the display. If k and m are both greater than n (the number of tiles), n will be used.

Example Grouping Data Into Five Tiles

```
TABLE FILE MOVIES
PRINT TITLE
BY CATEGORY
BY LISTPR IN-GROUPS-OF 5 TILES
WHERE CATEGORY EQ 'ACTION' OR 'CHILDREN'
END
```

The output is:

CATEGORY	LISTPR	TILE	TITLE
-----	-----	----	-----
ACTION	14.95	1	TOP GUN
	19.95	2	JAWS
			RAMBO III
	19.98	4	ROBOCOP
	19.99	5	TOTAL RECALL
CHILDREN	14.95	1	SESAME STREET-BEDTIME STORIES AND SONGS
	14.98	1	ROMPER ROOM-ASK MISS MOLLY
	19.95	2	SMURFS, THE
			SCOOBY-DOO-A DOG IN THE RUFF
	26.99	3	BAMBI
	29.95	4	ALICE IN WONDERLAND
			SLEEPING BEAUTY
	44.95	5	SHAGGY DOG, THE

Note that the tiles are assigned within the higher-level sort field CATEGORY. The ACTION category does not have any data assigned to tile 3. The CHILDREN category has all five tiles.

Example Displaying the First Three Tile Groups

The following request prints only the first three tiles in each category:

```
TABLE FILE MOVIES
PRINT TITLE
BY CATEGORY
BY LOWEST 3 LISTPR IN-GROUPS-OF 5 TILES
WHERE CATEGORY EQ 'ACTION' OR 'CHILDREN'
END
```

The output is:

CATEGORY	LISTPR	TILE	TITLE
-----	-----	----	-----
ACTION	14.95	1	TOP GUN
	19.95	2	JAWS
			RAMBO III
	19.98	4	ROBOCOP
CHILDREN	14.95	1	SESAME STREET-BEDTIME STORIES AND SONGS
	14.98	1	ROMPER ROOM-ASK MISS MOLLY
	19.95	2	SMURFS, THE
			SCOOBY-DOO-A DOG IN THE RUFF
	26.99	3	BAMBI

Note that the request displays three tile groups in each category. Because no data was assigned to tile 3 in the ACTION category, tiles 1, 2, and 4 display for that category.

Example Displaying Tiles With a Value of Three or Less

In the following request, the TOP 3 phrase restricts the display to tile numbers less than or equal to 3:

```
TABLE FILE MOVIES
PRINT TITLE
BY CATEGORY
BY LOWEST 3 LISTPR IN-GROUPS-OF 5 TILES TOP 3
WHERE CATEGORY EQ 'ACTION' OR 'CHILDREN'
END
```


The output is:

CATEGORY	LISTPR	TILE	TITLE
-----	-----	----	-----
ACTION	14.95	1	TOP GUN
	19.95	2	JAWS
			RAMBO III
CHILDREN	14.95	1	SESAME STREET-BEDTIME STORIES AND SONGS
	14.98	1	ROMPER ROOM-ASK MISS MOLLY
	19.95	2	SMURFS, THE
			SCOOBY-DOO-A DOG IN THE RUFF
	26.99	3	BAMBI

Because no data was assigned to tile 3 in the ACTION category, only tiles 1 and 2 display for that category.

Example Grouping Data Into Tiles and Customizing Column Headings

The following request changes the column headings for both the LISTPR and TILE columns:

```
TABLE FILE MOVIES
PRINT TITLE
BY CATEGORY
BY LISTPR AS 'PRICE' IN-GROUPS-OF 10 TILES TOP 3 AS 'DECILE'
WHERE CATEGORY EQ 'ACTION' OR 'CHILDREN'
END
```

The output is:

CATEGORY	PRICE	DECILE	TITLE
-----	-----	-----	-----
ACTION	14.95	1	TOP GUN
	19.95	3	JAWS
			RAMBO III
CHILDREN	14.95	1	SESAME STREET-BEDTIME STORIES AND SONGS
	14.98	2	ROMPER ROOM-ASK MISS MOLLY
	19.95	3	SMURFS, THE
			SCOOBY-DOO-A DOG IN THE RUFF

Reference Usage Notes for Tiles

- If a request retrieves data from segments that are descendents of the segment containing the tile field, multiple report rows may correspond to one instance of the tile field. These additional report rows do not affect the number of instances used to assign the tile values. However, if you retrieve fields from multiple segments and create a single-segment extract file, this flat file will have multiple instances of the tile field, and this increased number of instances may affect the tile values assigned. Therefore, when you can run the same request against the multi-level file and the single-segment file different tile assignments may result.
- Tiles are always calculated on a BY sort field in the request.
- Only one tiles calculation is supported per request. However, the request can contain up to five (the maximum allowed) non-tile IN-GROUP-OF phrases in addition to the TILES phrase.

- Comparisons for the purpose of assigning tile numbers use exact data values regardless of their display format. Therefore, if you display a floating-point value as D7, you may not be showing enough significant digits to indicate why values are placed in separate tiles.
- The tile field can be a real field or a virtual field created with a DEFINE command or a DEFINE in the Master File. The COMPUTE command cannot be used to create a tile field.
- Empty tiles do not display in the report output.
- In requests with multiple display commands, tiles are supported only at the lowest level and only with the BY LOWEST phrase.
- Tiles are supported with extract files. However, the field used to calculate the tiles will propagate three fields to a HOLD file unless you set HOLDLIST to PRINTONLY.
- Tiles are not supported with BY TOTAL, TABLEF, FML, and GRAPH.

Reference Tiles Error Messages

```
(FOC32408)  BY HIGHEST/LOWEST n: n should be positive
(FOC32410)  TILES: MORE THAN 1 IN-GROUPS-OF n TILES
(FOC32411)  TILES: n in IN-GROUPS-OF n TILES is too large
(FOC32412)  TILES: IN-GROUPS-OF n TILES TOP m - wrong values
              m and n in request are required to be positive

(FOC32413)  TILES are not supported with BY TOTAL
(FOC32414)  TILES are supported only in TABLE request
```

NF789: FORECAST

The FORECAST feature allows you to uncover trends in numeric data. Depending on the options you specify, it can also provide predicted values beyond the range of the values stored in the data source.

The methods available for calculating trend values are:

- Simple moving average (MOVAVE). This method calculates a series of arithmetic means using a user-specified number of values from a report column.
- Exponential moving average (EXPAVE). This method calculates a weighted average between the previously calculated value of the average and the next data point.
- Linear regression analysis (REGRESS). This method derives the coefficients of a straight line that best fits the data points and uses this linear equation to estimate values.

To generate predicted values, FORECAST continues the same calculations beyond the data points by using the generated trend values as new data points. For the REGRESS technique, the calculated regression equation is used to derive trend and predicted values.

FORECAST Processing

You invoke FORECAST using a special version of the ON *sortfield* RECAP command. In this command you specify the parameters needed for generating estimated values, including the field to be used in the calculations, the method to use, and the number of predictions to generate. T

he RECAP field can be a new field or it can be the same field used in the FORECAST calculations:

- If the RECAP field is the same as the field being used to generate the FORECAST calculations, it is referred to as a *recursive* FORECAST. In this case, the original field is not printed, even if it was referenced in the display command, and the RECAP column contains the original field values followed by the number of predicted values specified in the FORECAST syntax. No trend values display in the report. However, the original column will be propagated to an output file unless you set HOLDLIST to PRINTONLY
- If the RECAP field is a new field, the original field and the new field both display in the report output (if the original field was mentioned in the display command). This is referred to as a *non-recursive* FORECAST. The new field will contain trend values (estimated values *within* the range of the existing data points) and, depending on the arguments you supply, forecast values (predictions *beyond* the range of the existing data points).

The sort field used for FORECAST must be a numeric or smart date field. FORECAST operates on the last ACROSS field in the request. If the request contains no ACROSS fields, it operates on the last BY field. However, to use an ACROSS field with FORECAST the display command must be SUM (or its synonyms ADD or WRITE) or COUNT. The command cannot be PRINT or LIST. The FORECAST calculations start over when the highest-level sort field changes its value. In a request with multiple display commands, FORECAST operates on the last ACROSS field (or if there are no ACROSS fields, the last BY field) of the last display command.

Although you pass parameters to FORECAST using an argument list in parentheses, FORECAST is not a function. It can coexist with a user-written subroutine of the same name, as long as the user-written subroutine is not specified in a RECAP command.

Syntax How to Use FORECAST

The following syntax is for the MOVAVE and EXPAVE methods:

```
ON sfld RECAP fld1[/fmt] = FORECAST(fld2, interval, npredict,  
'method',npoint);
```

The following syntax is for the REGRESS method (omits the *npoint* parameter):

```
ON sfld RECAP fld1[/fmt] = FORECAST(fld2, interval, npredict, 'REGRESS');
```

where:

sfld

Is the last ACROSS field in the request and must be a numeric or smart date field. If the request contains no ACROSS phrases, FORECAST works on the last BY field. However, FORECAST is only supported with ACROSS when the display command is SUM, WRITE, ADD, or COUNT.

fld1

Is a numeric field. It can be a real field, a virtual field, or a calculated field.

Note: The word FORECAST and the opening parenthesis must be on the same line as the syntax *fld1*=.

fmt

Is the display format for *fld1*. If it is omitted, the default format is D12.2. Even if *fld1* was previously reformatted using a DEFINE or COMPUTE command, the format specified in the RECAP command is respected.

fld2

Can be any numeric field. If it is the same as *fld1* (recursive), the predicted values will be appended to the report column after the data values, and the original column is not printed in the report. If it is a different name than *fld1* (non-recursive), this new column will be calculated containing both trend values (estimated values within the range of the existing data points) and, if you specify a non-zero number of predictions, forecast values (predictions beyond the range of the existing data points), while retaining the original field as a separate report column, if it was referenced in the display command.

interval

Is the increment to add to each *sfd* value (after the last data point) to get to the next. It must be a positive whole number. To sort in descending order, use the BY HIGHEST phrase. The result of adding this number to the *sfd* values will be converted to the same format as *sfd*.

For a date sort field, the minimal component in the format determines how the number is interpreted. For example, if the format is YMD, MDY, or DMY, an interval value of 2 is interpreted as meaning two days; if the format is YM, the 2 is interpreted as meaning two months.

npredict

Is the number of predictions for FORECAST to calculate. It must be a whole number greater than or equal to zero. Zero indicates that you want no predictions. Zero is only supported when the RECAP field is a new field (non-recursive), not the same field used as the first parameter to FORECAST. If you supply a number that is not a whole number, the fractional portion is dropped.

method

Is the estimation method to use. It can be one of the following values enclosed in single quotation marks:

Method	Definition
MOVAVE	Simple moving average
EXPAVE	Exponentially smoothed moving average
REGRESS	Linear regression

npoint

Is a positive whole number that specifies the number of values to average for the MOVAVE method. For EXPAVE, this number is used to calculate the weights for each component in the average. This parameter must be specified for MOVAVE and EXPAVE and omitted for REGRESS. If you supply a number that is not a whole number, the fractional portion is dropped.

Reference Usage Notes for FORECAST

- For averages, data values should be evenly spaced in order to get meaningful results.
- The RECAP command used with FORECAST can contain only the FORECAST syntax. FORECAST does not recognize any syntax after the closing semicolon (;). To specify options such as AS or IN:
 - If it a non-recursive FORECAST request (creates a new field), use an empty COMPUTE command prior to the RECAP.
 - If it is a recursive FORECAST request, specify the options when the field is first referenced in the report request.

- FORECAST operates on the last ACROSS field, and if the request contains no ACROSS phrases, FORECAST operates on the last BY field.
- FORECAST is only supported for ACROSS fields if the display command is SUM, COUNT, WRITE, or ADD. You cannot use FORECAST on an ACROSS field if the display command is LIST or PRINT.
- In a request with multiple display commands, FORECAST must be applied to the last ACROSS field (or if there are no ACROSS fields, the last BY field) in the last display command. If you use FORECAST to recalculate a field in the request, the original value of the field will be used everywhere except in the columns displayed by the last display command in the request.
- BY TOTAL is not supported.
- MORE, MATCH, FOR, and OVER are not supported.
- The LINES and RECORDS statistics are affected by FORECAST.
- The process of generating the FORECAST values creates extra columns that are not printed in the report output. The number and placement of these additional columns varies depending on the specific request. Therefore, use of column notation is not supported in a request that includes FORECAST.
- SUMMARIZE and RECOMPUTE are not supported for the same sort field used for FORECAST.
- FORECAST is not supported for the FOCUS GRAPH facility; it is supported for the iWay GRAPH facility.
- A request can contain up to seven non-FORECAST RECAP commands and up to seven additional FORECAST RECAP commands.

- The left side of a RECAP command used for FORECAST supports the CURR attribute for doing currency conversions. The MISSING attribute is not supported in the RECAP command.
- A request that creates a new field using the REGRESS method with the SUM command produces a regression based on the detail data values, not the summed values. This is not true if the REGRESS method is used to replace an existing field.

Forecasting Methods

The methods available with FORECAST may sometimes be used to predict values outside the range of the existing data points. However, these methods are not always reliable predictors. Many factors determine how accurate a prediction will be. The FORECAST operation performs the calculations based on the data provided. Decisions about their use and reliability are the user's responsibility.

Using a Simple Moving Average

A simple moving average is a series of arithmetic means calculated with a user-specified number of values, n , from a report column. Each new mean in the series is calculated by dropping the first value used in the prior calculation and adding the next data value to the calculation.

Simple moving averages are sometimes used to analyze trends in stock prices over time. In this scenario, the average is calculated using n periods worth of stock prices. A disadvantage to this indicator is that because it drops the oldest values from the calculation as it moves on in time, it loses its memory over time. Also, mean values are distorted by extreme highs and lows and give equal weight to each point.

Predicted values beyond the range of the data values are calculated using a moving average that treats the calculated trend values as new data points.

The first complete moving average occurs at the n th data point because the calculation requires n values. This is called the lag. The moving average values for the lag rows are calculated as follows: the first value in the moving average column is equal to the first data value, the second value in the moving average column is the average of the first two data values, and so on until the n th row at which point there are enough values to calculate the moving average with the number of values specified.

Example Calculating a New Simple Moving Average Column

This request defines an integer value named PERIOD to use as the independent variable for the moving average. It predicts three periods of values beyond the range of the retrieved data:

```
DEFINE FILE GGSALES
  SDATE/YYM = DATE;
  SYEAR/Y = SDATE;
  SMONTH/M = SDATE;
  PERIOD/I2 = SMONTH;
END
TABLE FILE GGSALES
  SUM UNITS DOLLARS
  BY CATEGORY BY PERIOD
  WHERE SYEAR EQ 97 AND CATEGORY NE 'Gifts'
  ON PERIOD RECAP MOVAVE/D10.1= FORECAST(DOLLARS,1,3,'MOVAVE',3);
END
```

The output is:

Category	PERIOD	Unit Sales	Dollar Sales	MOVAVE
-----	-----	-----	-----	-----
Coffee	1	61666	801123	801,123.0
	2	54870	682340	741,731.5
	3	61608	765078	749,513.7
	4	57050	691274	712,897.3
	5	59229	720444	725,598.7
	6	58466	742457	718,058.3
	7	60771	747253	736,718.0
	8	54633	655896	715,202.0
	9	57829	730327	711,158.7
	10	57012	724412	703,545.0
	11	51110	620264	691,667.7
	12	58981	762328	702,334.7
	13	0	0	694,975.6
	14	0	0	719,879.4
	15	0	0	705,729.9
Food	1	54394	672727	672,727.0
	2	54894	699073	685,900.0
	3	52713	642802	671,534.0
	4	58026	718514	686,796.3
	5	53289	660740	674,018.7
	6	58742	734705	704,653.0
	7	60127	760586	718,677.0
	8	55622	695235	730,175.3
	9	55787	683140	712,987.0
	10	57340	713768	697,381.0
	11	57459	710139	702,349.0
	12	57290	705315	709,740.7
	13	0	0	708,398.2
	14	0	0	707,818.0
	15	0	0	708,652.3

Note:

- The number of values to use in the average is 3.
- Three predicted values of MOVAVE are calculated within each value of CATEGORY. For values outside the range of the data, new PERIOD values are generated by adding the interval value (1) to the prior PERIOD value
- There are no UNITS or DOLLARS values for the generated PERIOD values.
- Each average (MOVAVE value) is computed using DOLLARS values where they exist. For predicted values beyond those points, the calculated MOVAVE values are used as new data points to continue the moving average, PERIOD is the independent variable (x) and MOVAVE is the dependent variable (y).

The first MOVAVE value (801,123.0) is equal to the first DOLLARS value.

The second MOVAVE value (741,731.5) is the mean of DOLLARS values one and two: $(801123 + 682340) / 2$.

The third MOVAVE value (749,513.7) is the mean of DOLLARS values one through three: $(801123 + 682340 + 765078) / 3$.

The fourth MOVAVE value (712,897.3) is the mean of DOLLARS values two through four: $(682340 + 765078 + 691274) / 3$.

The predicted MOVAVE values (starting with 694,975.6 for PERIOD 13) are calculated using the previous MOVAVE values as new data points. For example, the first predicted value (694,975.6) is the average of the data points from periods 11 and 12 (620,264 and 762328) and the moving average for period 12 (702334.7). The calculation is: $694,975 = (620,264 + 762328 + 702334.7) / 3$.

Example Using an Existing Field as a Simple Moving Average Column

The following is the request in [*Calculating a New Simple Moving Average Column*](#), but using same name for the RECAP field as for the first argument in the FORECAST parameter list. The trend values do not display in the report. The actual data values for DOLLARS are followed by the predicted values in the report column:

```
DEFINE FILE GGSales
  SDATE/YYM = DATE;
  SYEAR/Y = SDATE;
  SMONTH/M = SDATE;
  PERIOD/I2 = SMONTH;
END
TABLE FILE GGSales
  SUM UNITS DOLLARS
  BY CATEGORY BY PERIOD
  WHERE SYEAR EQ 97 AND CATEGORY NE 'Gifts'
  ON PERIOD RECAP DOLLARS/DI0.1 = FORECAST(
    DOLLARS,1,3,'MOVAVE',3);
END
```

The output is:

Category	PERIOD	Unit Sales	DOLLARS
-----	-----	-----	-----
Coffee	1	61666	801,123.0
	2	54870	682,340.0
	3	61608	765,078.0
	4	57050	691,274.0
	5	59229	720,444.0
	6	58466	742,457.0
	7	60771	747,253.0
	8	54633	655,896.0
	9	57829	730,327.0
	10	57012	724,412.0
	11	51110	620,264.0
	12	58981	762,328.0
	13	0	694,975.6
	14	0	719,879.4
	15	0	705,729.9
Food	1	54394	672,727.0
	2	54894	699,073.0
	3	52713	642,802.0
	4	58026	718,514.0
	5	53289	660,740.0
	6	58742	734,705.0
	7	60127	760,586.0
	8	55622	695,235.0
	9	55787	683,140.0
	10	57340	713,768.0
	11	57459	710,139.0
	12	57290	705,315.0
	13	0	708,398.2
	14	0	707,818.0
	15	0	708,652.3

Example Using a Date Sort Field With a Simple Moving Average

This request defines a smart date field in the form YYMD to use as the independent variable for the moving average. The format YYMD is used so that the interval between predictions will be based on months. The request predicts three months of values beyond the range of the retrieved data. The trend values, predicted values, and analysis are the same as in [Calculating a New Simple Moving Average Column](#):

```
DEFINE FILE GGSALES
  SDATE/YYM = DATE;
  SYEAR/Y = SDATE;
END
TABLE FILE GGSALES
  SUM UNITS DOLLARS
  BY CATEGORY BY SDATE
  WHERE SYEAR EQ 97 AND CATEGORY NE 'Gifts'
  ON SDATE RECAP MOVAVE/D10.1= FORECAST(DOLLARS,1,3,'MOVAVE',3);
END
```


The output is:

Category	SDATE	Unit Sales	Dollar Sales	MOVAVE
-----	-----	-----	-----	-----
Coffee	1997/01	61666	801123	801,123.0
	1997/02	54870	682340	741,731.5
	1997/03	61608	765078	749,513.7
	1997/04	57050	691274	712,897.3
	1997/05	59229	720444	725,598.7
	1997/06	58466	742457	718,058.3
	1997/07	60771	747253	736,718.0
	1997/08	54633	655896	715,202.0
	1997/09	57829	730327	711,158.7
	1997/10	57012	724412	703,545.0
	1997/11	51110	620264	691,667.7
	1997/12	58981	762328	702,334.7
	1998/01	0	0	694,975.6
	1998/02	0	0	719,879.4
Food	1998/03	0	0	705,729.9
	1997/01	54394	672727	672,727.0
	1997/02	54894	699073	685,900.0
	1997/03	52713	642802	671,534.0
	1997/04	58026	718514	686,796.3
	1997/05	53289	660740	674,018.7
	1997/06	58742	734705	704,653.0
	1997/07	60127	760586	718,677.0
	1997/08	55622	695235	730,175.3
	1997/09	55787	683140	712,987.0
	1997/10	57340	713768	697,381.0
	1997/11	57459	710139	702,349.0
	1997/12	57290	705315	709,740.7
	1998/01	0	0	708,398.2
	1998/02	0	0	707,818.0
	1998/03	0	0	708,652.3

Using an Exponential Moving Average

This method calculates an average that allows you to choose weights to apply to newer and older values.

The weight given to the newest value is k , where:

$$k = 2 / (1+n)$$

The quantity n is an integer greater than one. Increasing n increases the weight assigned to the earlier observations (or data instances) as compared to the later ones.

The next calculation of the exponential moving average (EMA) value is derived by the following formula:

$$\text{EMA} = (\text{EMA} * (1-k)) + (\text{datavalue} * k)$$

This means that the newest value from the data source is multiplied by the factor k and the current moving average is multiplied by the factor $(1-k)$. These quantities are then summed to generate the new EMA.

Note: When the data values are exhausted, the last average calculated is used as the next data value, making every predicted value a constant equal to the last calculated average.

Example Calculating a New Exponential Moving Average Column

```
DEFINE FILE GGSALES
  SDATE/YYM = DATE;
  SYEAR/Y = SDATE;
  SMONTH/M = SDATE;
  PERIOD/I2 = SMONTH;
END
TABLE FILE GGSALES
  SUM UNITS DOLLARS
  BY CATEGORY BY PERIOD
  WHERE SYEAR EQ 97 AND CATEGORY NE 'Gifts'
  ON PERIOD RECAP EXPAVE/D10.1= FORECAST(DOLLARS,1,3,'EXPAVE',3);
END
```

The output is:

Category	PERIOD	Unit Sales	Dollar Sales	EXPAVE
-----	-----	-----	-----	-----
Coffee	1	61666	801123	801,123.0
	2	54870	682340	741,731.5
	3	61608	765078	753,404.8
	4	57050	691274	722,339.4
	5	59229	720444	721,391.7
	6	58466	742457	731,924.3
	7	60771	747253	739,588.7
	8	54633	655896	697,742.3
	9	57829	730327	714,034.7
	10	57012	724412	719,223.3
	11	51110	620264	669,743.7
	12	58981	762328	716,035.8
	13	0	0	716,035.8
	14	0	0	716,035.8
	15	0	0	716,035.8
Food	1	54394	672727	672,727.0
	2	54894	699073	685,900.0
	3	52713	642802	664,351.0
	4	58026	718514	691,432.5
	5	53289	660740	676,086.3
	6	58742	734705	705,395.6
	7	60127	760586	732,990.8
	8	55622	695235	714,112.9
	9	55787	683140	698,626.5
	10	57340	713768	706,197.2
	11	57459	710139	708,168.1
	12	57290	705315	706,741.6
	13	0	0	706,741.6
	14	0	0	706,741.6
	15	0	0	706,741.6

Note:

- The number n , which is used to calculate the weights is 3.
- Three predicted values of EXPAVE are calculated within each value of CATEGORY. For values outside the range of the data, new PERIOD values are generated by adding the interval value (1) to the prior PERIOD value.
- There are no UNITS or DOLLARS values for the generated PERIOD values.
- Each average is computed using DOLLARS values where they exist. For predicted values beyond those points, the calculated EXPAVE values are used as new data points in the exponential average calculation.

The first EXPAVE value (801,123.0) is the same as the first DOLLARS value.

The second EXPAVE value (741,731.5) is calculated as follows. Note that because of rounding and the number of decimal places used, the value derived in this sample calculation varies slightly from the one displayed in the report output:

```
n=3 (number used to calculate weights)
k = 2/(1+n) = 2/4 = 0.5
EXPAVE = (EXPAVE*(1-k))+(new-DOLLARS*k) = (801123*0.5) +
(682340*0.50)
= 400561.5 + 341170 = 741731.5
```

The third EXPAVE value (753,404.8) is calculated as follows:

```
EXPAVE = (EXPAVE*(1-k))+(new-DOLLARS*k) =
(741731.5*0.5)+(765078*0.50)
= 370865.75 + 382539 = 753404.75
```

The predicted EXPAVE values (starting with 706,741.6) are calculated using the same formula as used to calculate the trend values. However, an exponential average is always calculated using the previous average and the new data point. Because the previous average is also used as the new data point, the predicted values are always equal to the last trend value. For example, for period 13, the previous average is 706,741.6 and this is also used as the next data point, therefore, the average is calculated as follows:

$$(706,741.6 * 0.5) + (706,741.6 * 0.5) = 706,741.6$$

$$\text{EXPAVE} = (\text{EXPAVE} * (1-k)) + (\text{new-DOLLARS} * k) = (706741.6 * 0.5) + (706741.6 * 0.5) = 353370.8 + 353370.8 = 706741.6$$

Example Using an Existing Field for an Exponential Moving Average

The following is the request in [Calculating a New Exponential Moving Average Column](#), but using same name for the RECAP field as for the first argument in the FORECAST parameter list.

The trend values do not display in the report. The actual data values for DOLLARS are followed by the predicted values in the report column:

```
DEFINE FILE GGSALES
  SDATE/YYM = DATE;
  SYEAR/Y = SDATE;
  SMONTH/M = SDATE;
  PERIOD/I2 = SMONTH;
END
TABLE FILE GGSALES
  SUM UNITS DOLLARS
  BY CATEGORY BY PERIOD
  WHERE SYEAR EQ 97 AND CATEGORY NE 'Gifts'
  ON PERIOD RECAP DOLLARS/D10.1 = FORECAST(
    DOLLARS,1,3,'EXPAVE',3);
END
```

The output is:

Category	PERIOD	Unit Sales	DOLLARS
-----	-----	-----	-----
Coffee	1	61666	801,123.0
	2	54870	682,340.0
	3	61608	765,078.0
	4	57050	691,274.0
	5	59229	720,444.0
	6	58466	742,457.0
	7	60771	747,253.0
	8	54633	655,896.0
	9	57829	730,327.0
	10	57012	724,412.0
	11	51110	620,264.0
	12	58981	762,328.0
	13	0	716,035.8
	14	0	716,035.8
	15	0	716,035.8
Food	1	54394	672,727.0
	2	54894	699,073.0
	3	52713	642,802.0
	4	58026	718,514.0
	5	53289	660,740.0
	6	58742	734,705.0
	7	60127	760,586.0
	8	55622	695,235.0
	9	55787	683,140.0
	10	57340	713,768.0
	11	57459	710,139.0
	12	57290	705,315.0
	13	0	706,741.6
	14	0	706,741.6
	15	0	706,741.6

Using a Linear Regression Equation

This method estimates values by assuming that the dependent variable (y , the new calculated values) and the independent variable (x , the sort field values) are related by the following function, which represents a straight line:

$$y = mx + b$$

The value of m represents the slope of the line, and b represents the y -intercept.

REGRESS uses a technique called Ordinary Least Squares to calculate values for m and b that minimize the sum of the squared differences between the data and the resulting line.

The following formulas show how m and b are calculated. In these formulas, n is the number of data points, the y values are the data values (dependent variable), and the x values are the sort field values (independent variable):

$$m = (\sum xy - (\sum x * \sum y) / n) / (\sum x^2 - (\sum x)^2 / n)$$

$$b = (\sum y) / n - (m * (\sum x) / n)$$

Trend values as well as predicted values are calculated using the regression line equation.

Example Calculating a New Linear Regression Field

```
TABLE FILE CAR
PRINT MPG
BY DEALER_COST
WHERE MPG NE 0.0
      ON DEALER_COST RECAP FORMPG=FORECAST(MPG,1000,3,'REGRESS');
END
```

The output is:

DEALER_COST	MPG	FORMPG
-----	---	-----
2,886	27	25.51
4,292	25	23.65
4,631	21	23.20
4,915	21	22.82
5,063	23	22.63
5,660	21	21.83
	21	21.83
5,800	24	21.65
6,000	24	21.38
7,427	16	19.49
8,300	18	18.33
8,400	18	18.20
10,000	18	16.08
11,000	18	14.75
11,194	9	14.50
14,940	11	9.53
15,940	0	8.21
16,940	0	6.88
17,940	0	5.55

Note:

- Three predicted values of FORMPG are calculated . For values outside the range of the data, new DEALER_COST values are generated by adding the interval value (1,000) to the prior DEALER_COST value.
- There are no MPG values for the generated DEALER_COST values.

- Each FORMPG value is computed using a regression line calculated using all of the actual data values for MPG.

DEALER_COST is the independent variable (x) and MPG is the dependent variable (y). The equation is used to calculate MPGFORECAST trend and predicted values.

In this case, the equation is approximately as follows:

$$\text{FORMPG} = (-0.001323 * \text{DEALER_COST}) + 29.32$$

The predicted values are (the values are not exactly as calculated by FORECAST because of rounding, but they show the process of calculating the values):

DEALER_COST	Calculation	FORMPG
15,940	$(-0.001323 * 15,940) + 29.32$	8.23
16,940	$(-0.001323 * 16,940) + 29.32$	6.91
17,940	$(-0.001323 * 17,940) + 29.32$	5.59

Example Using an Existing Field as a Linear Regression Column

The following is the request in [Calculating a New Linear Regression Field](#), but using same name for the RECAP field as for the first argument in the FORECAST parameter list. The trend values do not display in the report.

The actual data values for MPG are followed by the predicted values in the report column:

```
TABLE FILE CAR
PRINT MPG
BY DEALER_COST
WHERE MPG NE 0
      ON DEALER_COST RECAP MPG = FORECAST(MPG,1000,3,'REGRESS');
END
```

The output is:

DEALER_COST	MPG
-----	---
2,886	27.00
4,292	25.00
4,631	21.00
4,915	21.00
5,063	23.00
5,660	21.00
	21.00
5,800	24.20
6,000	24.20
7,427	16.00
8,300	18.00
8,400	18.00
10,000	18.00
11,000	18.00
11,194	9.00
14,940	11.00
15,940	8.21
16,940	6.88
17,940	5.55

FORECAST Reporting Techniques

You can use FORECAST multiple times in one request. However, the FORECAST requests must all specify the same sort field, interval, and number of predictions. Only the RECAP field, method, field used to calculate the FORECAST values, and number of points to average can change. If you change any of the other parameters, the new parameters are ignored.

If you want to move a FORECAST column in the report output, use an empty COMPUTE command for the FORECAST field as a placeholder. The data type (I, F, P, D) must be the same in the COMPUTE command and the RECAP command.

To make the report output easier to interpret, you can create a field that indicates whether the FORECAST value in each row is a predicted value. To do this, define a virtual field whose value is always a constant other than zero. Rows in the report output that represent actual records in the data source will display this constant. Rows that represent predicted values will display zero. You can also propagate this field to a HOLD file.

Example Generating Multiple FORECAST Columns in a Request

This example calculates moving averages and exponential averages for both the DOLLARS and BUDDOLLARS fields in the GGSales data source.

The sort field, interval, and number of predictions are the same for all of the calculations:

```
DEFINE FILE GGSales
  SDATE/YM = DATE;
  SYEAR/Y = SDATE;
  SMONTH/M = SDATE;
  PERIOD/I2 = SMONTH;
END
TABLE FILE GGSales
  SUM  DOLLARS AS 'DOLLARS' BUDDOLLARS AS 'BUDGET'
  BY  CATEGORY NOPRINT BY PERIOD AS 'PER'
  WHERE SYEAR EQ 97 AND CATEGORY EQ 'Coffee'
  ON PERIOD RECAP DOLMOVAVE/D10.1= FORECAST(DOLLARS,1,0,'MOVAVE',3);
  ON PERIOD RECAP DOLEXPAVE/D10.1= FORECAST(DOLLARS,1,0,'EXPAVE',4);
  ON PERIOD RECAP BUDMOVAVE/D10.1 = FORECAST(BUDDOLLARS,1,0,'MOVAVE',3);
  ON PERIOD RECAP BUDEXPAVE/D10.1 = FORECAST(BUDDOLLARS,1,0,'EXPAVE',4);
END
```

The output is:

PER	DOLLARS	BUDGET	DOLMOVAVE	DOLEXPAVE	BUDMOVAVE	BUDEXPAVE
---	-----	-----	-----	-----	-----	-----
1	801123	801375	801,123.0	801,123.0	801,375.0	801,375.0
2	682340	725117	741,731.5	753,609.8	763,246.0	770,871.8
3	765078	810367	749,513.7	758,197.1	778,953.0	786,669.9
4	691274	717688	712,897.3	731,427.8	751,057.3	759,077.1
5	720444	739999	725,598.7	727,034.3	756,018.0	751,445.9
6	742457	742586	718,058.3	733,203.4	733,424.3	747,901.9
7	747253	773146	736,718.0	738,823.2	751,910.3	757,999.6
8	655896	685170	715,202.0	705,652.3	733,634.0	728,867.7
9	730327	753760	711,158.7	715,522.2	737,358.7	738,824.6
10	724412	709397	703,545.0	719,078.1	716,109.0	727,053.6
11	620264	630452	691,667.7	679,552.5	697,869.7	688,413.0
12	762328	718837	702,334.7	712,662.7	686,228.7	700,582.6

Example Moving the FORECAST Column

The following example places the DOLLARS field after the MOVAVE field by using an empty COMPUTE command as a placeholder for the MOVAVE field. Both the COMPUTE command and the RECAP command specify formats for MOVAVE (of the same data type), but the format on the RECAP command takes precedence:

```
DEFINE FILE GGSales
    SDATE/YYM = DATE;
    SYEAR/Y = SDATE;
    SMONTH/M = SDATE;
    PERIOD/I2 = SMONTH;
END
TABLE FILE GGSales
    SUM    UNITS
    COMPUTE MOVAVE/D10.2 = ;
    DOLLARS
        BY CATEGORY BY PERIOD
        WHERE SYEAR EQ 97 AND CATEGORY EQ 'Coffee'
        ON PERIOD RECAP MOVAVE/D10.1= FORECAST(DOLLARS,1,3,'MOVAVE',3);
END
```

The output is:

Category	PERIOD	Unit Sales	MOVAVE	Dollar Sales
-----	-----	-----	-----	-----
Coffee	1	61666	738,659.3	801123
	2	54870	734,447.5	682340
	3	61608	749,513.7	765078
	4	57050	712,897.3	691274
	5	59229	725,598.7	720444
	6	58466	718,058.3	742457
	7	60771	736,718.0	747253
	8	54633	715,202.0	655896
	9	57829	711,158.7	730327
	10	57012	703,545.0	724412
	11	51110	691,667.7	620264
	12	58981	702,334.7	762328
	13	0	694,975.6	0
	14	0	719,879.4	0
	15	0	705,729.9	0

Example Distinguishing Data Rows From Predicted Rows

In the following example, the DATA_ROW virtual field has the value 1 for each row in the data source. It has the value zero for the predicted rows.

The PREDICT field is calculated as YES for predicted rows and NO for rows containing data:

```
DEFINE FILE CAR
DATA_ROW/I1 = 1;
END
TABLE FILE CAR
  PRINT DATA_ROW
COMPUTE PREDICT/A3 = IF DATA_ROW EQ 1 THEN 'NO' ELSE 'YES' ;
MPG
BY DEALER_COST
WHERE MPG GE 20
  ON DEALER_COST RECAP FORMPG/D12.2=FORECAST(MPG,1000,3,'REGRESS');
  ON DEALER_COST RECAP MPG          =FORECAST(MPG,1000,3,'REGRESS');
END
```

The output is:

DEALER_COST	DATA_ROW	PREDICT	MPG	FORMPG
-----	-----	-----	---	-----
2,886	1	NO	27.00	25.65
4,292	1	NO	25.00	23.91
4,631	1	NO	21.00	23.49
4,915	1	NO	21.00	23.14
5,063	1	NO	23.00	22.95
5,660	1	NO	21.00	22.21
	1	NO	21.00	22.21
5,800	1	NO	24.20	22.04
6,000	1	NO	24.20	21.79
7,000	0	YES	20.56	20.56
8,000	0	YES	19.32	19.32
9,000	0	YES	18.08	18.08

Reference FORECAST Error Messages

(FOC36320) FORECAST/REGRESS SYNTAX ERROR

(FOC36322) ON FIELD IS NOT LAST BY OR ACROSS FIELD

FORECAST can only be performed on the last ACROSS field.
If ACROSS is not specified then on last BY field.

(FOC36323) EXPRESSIONS ARE NOT PERMITTED IN PARAMETERS

In FORECAST/REGRESS, parameters cannot be presented
as expressions but only as fields or constants.

(FOC36324) VERB OBJECT OR INTERVAL CANNOT BE A QUOTED CONSTANT

All parameters of FORECAST/REGRESS except 'method' should
not
contain quotes.

(FOC36325) FORECAST/REGRESS VERB OBJECT IS NOT RECOGNIZED

The verb object is not found in either a master file
or a prior DEFINE section or a COMPUTE statement.

(FOC36326) INTERVAL OR NUMBER IS NOT CONVERTED AS ASSUMED TYPE

In FORECAST, parameter 'interval' must have
the type of the field which it increments. Parameters
'npoint', and 'npredict' must be a positive whole number.

(FOC36327) MATHEMATICAL METHOD IS NOT RECOGNIZED

In FORECAST, only three method functions can be used in
a 'method' parameter. They are 'REGRESS', 'MOVAVE', and
'EXPAVE'.

(FOC36328) **INCORRECT USE OF NUMERIC FORECAST PARAMETERS**

In FORECAST/REGRESS, a numeric parameter such as 'number', 'npredict', 'interval', or 'npoint' is either non-positive or exceeds an allowed limit.

(FOC36329) **INVALID FORECAST REQUEST: PRINT/LIST with ACROSS**

It is illegal to use FORECAST together with an ACROSS phrase when the command is LIST or PRINT. Only the SUM command can be used in this case.

(FOC36330) **INTERNAL FORECAST/REGRESS ERROR**

Unforeseen error has occurred in routines for FORECAST/REGRESS.
Please report the problem to an Information Builders representative.

(FOC36333) **INVALID FORECAST/REGRESS REQUEST**

'MORE', 'OVER', 'GRAPH', 'MODIFY', 'FOR', and 'BY TOTAL' as well as re-formatting into non-numeric type of field are not permitted in FORECAST/REGRESS.

NF790: ACROSS-TOTAL

ACROSS-TOTAL produces totals for columns of numbers created by an ACROSS sort phrase. The display of data on a report makes the report simple to read and understand. Integer, single precision floating point, double precision floating point, packed and long packed fields can all be totaled.

ACROSS-TOTAL differs from ROW-TOTAL in that ACROSS-TOTAL only totals the ACROSS column data, excluding the sorted column data that ROW-TOTAL displays.

Syntax How to Request ACROSS-TOTAL in a Report

```
ACROSS sortfield ACROSS-TOTAL [AS 'name'] [COLUMNS col1 AND col2 ...]
```

where:

sortfield

Is the name of the field being sorted across.

name

Is the new name for the ACROSS-TOTAL column title.

col1, *col2*

Are the titles of the ACROSS columns you want to include in the total.

Example Requesting ACROSS-TOTAL in a Report

```
TABLE FILE MOVIES
SUM COPIES BY CATEGORY
COUNT TITLE BY CATEGORY
ACROSS RATING ACROSS-TOTAL
COLUMNS PG AND R
END
```

The output is:

CATEGORY	COPIES	RATING		
		PG	R	TOTAL
		TITLE	TITLE	TITLE
		COUNT	COUNT	COUNT
ACTION	14	2	3	5
COMEDY	16	4	1	5
DRAMA	2	0	1	1
FOREIGN	5	2	3	5
MUSICALS	2	1	1	2
MYSTERY	17	2	5	7
SCI/FI	3	0	3	3

Reference Usage Notes for ACROSS-TOTAL

- Stacking headings in ACROSS-TOTAL is not allowed.
- Attempts to use ACROSS-TOTAL with other types of fields (alphanumeric, text, and dates) produces blank columns.
- In cases of multiple ACROSS columns with ACROSS-TOTAL there will be additional columns with subtotaled values.
- The results of ROW-TOTAL and ACROSS-TOTAL are the same if there is only a single display field or single display command in the procedure.
- The maximum number of ACROSS-TOTAL phrases is 5.

NF792: SET CDN Command Enhancement

Continental Decimal Notation (CDN) includes the SPACE and QUOTE settings to support countries that require spaces and apostrophes in numbers.

Syntax How to Set Continental Decimal Notation

`SET CDN = cdn`

Possible values are:

OFF

Sets the decimal point as a period and the thousands separator as a comma. OFF is the default.

OFF should be used for the USA, Canada, Mexico, and the United Kingdom.

ON

Sets the decimal point as a comma and the thousands separator as a period.

ON should be used for Germany, Denmark, Italy, Spain, and Brazil.

SPACE

Sets the decimal point as a comma and the thousands separator as a space.

SPACE should be used for France, Norway, Sweden, and Finland.

QUOTE

Sets the decimal point as a comma and the thousands separator as an apostrophe.

QUOTE should be used for Switzerland.

Example How Continental Decimal Notation is Displayed

The following table shows how 1234.56 is displayed depending on the setting of CDN.

OFF	1,234.56
ON	1.234,56
SPACE	1 234,56
QUOTE	1'234,56

NF793: Displaying Fractions

You can use the SET CENT-ZERO command to display fractions in a format that accommodates a country's needs. The setting of CDN determines whether a decimal point or comma displays for fractions.

Syntax How to Display Fractions

SET CENT-ZERO = {OFF|ON}

where:

OFF

Displays fractions with either a decimal point or comma in front of the number depending on how Continental Decimal Notation (CDN) is set. OFF is the default.

ON

Displays fractions with a leading zero. The fraction contains either a decimal point or comma depending on the setting of CDN.

Example Displaying of Fractions

The following shows how the number 1234.56 and the fraction.12 are displayed depending on the setting of CENT-ZERO.

CENT-ZERO Setting	CDN Setting	1,234.56	.12
OFF	OFF	1,234.56	,12
	ON	1.234,56	,12
	QUOTE	1'234,56	,12
	SPACE	1 234,56	,12
ON	OFF	1,234.56	0.12
	ON	1.234,56	0,12
	QUOTE	1'234,56	0,12
	SPACE	1 234,56	0,12

NF796: Unlimited Nested -INCLUDE Commands

The Dialogue Manager -INCLUDE command dynamically inserts a stored procedure (FOCEXEC file) into another stored procedure at run time. The inserted file can contain an entire procedure or any part of a procedure. For example, you can use this technique to insert common virtual field definitions or heading text into multiple procedures.

-INCLUDE commands are considered *nested* when a file that is inserted into a procedure using the -INCLUDE command itself contains a -INCLUDE command.

Note: The level of nesting is limited only by the available memory. In prior releases, -INCLUDE commands could be nested up to four levels deep.

Example Using Nested -INCLUDE Commands

Consider the following sequence of files:

INCLUDE1:

```
-DEFAULTS &ECHO = ON  
TABLE FILE MOVIES  
-INCLUDE INCLUDE2
```

INCLUDE2:

```
HEADING CENTER  
"UNLIMITED -INCLUDE COMMANDS"  
-INCLUDE INCLUDE3
```

INCLUDE3:

```
PRINT TITLE RATING LISTPR  
-INCLUDE INCLUDE4
```

INCLUDE4:

```
BY CATEGORY
-INCLUDE INCLUDE5
```

INCLUDE5:

```
WHERE CATEGORY EQ 'ACTION' OR 'MUSICALS'
-INCLUDE INCLUDE6
```

INCLUDE6:

```
ON CATEGORY SUBTOTAL LISTPR
ON TABLE NOTOTAL
END
```

Now issue the following command:

```
EX INCLUDE1
```

The resulting procedure (displayed by setting the variable &ECHO to ON) is:

```
TABLE FILE MOVIES
HEADING CENTER
"UNLIMITED -INCLUDE COMMANDS"
PRINT TITLE RATING LISTPR
BY CATEGORY
WHERE CATEGORY EQ 'ACTION' OR 'MUSICALS'
ON CATEGORY SUBTOTAL LISTPR
ON TABLE NOTOTAL
END
```

The output is:

UNLIMITED -INCLUDE COMMANDS			
CATEGORY	TITLE	RATING	LISTPR
-----	-----	-----	-----
ACTION	JAWS	PG	19.95
	ROBOCOP	R	19.98
	TOTAL RECALL	R	19.99
	TOP GUN	PG	14.95
	RAMBO III	R	19.95
*TOTAL ACTION			94.82
MUSICALS	CABARET	PG	19.98
	ALL THAT JAZZ	R	19.98
	CHORUS LINE, A	PG13	14.98
	FIDDLER ON THE ROOF	G	29.95
*TOTAL MUSICALS			84.89

Reference Usage Notes for Unlimited Nested -INCLUDE Commands

- Recursive nesting of -INCLUDE or EX commands is not allowed. That is, a file that is inserted using the -INCLUDE command cannot directly or indirectly -INCLUDE or EX itself.

An indirect recursion would occur if procedure A contained a -INCLUDE command for procedure B and procedure B contained a -INCLUDE or EX command for procedure A.

Recursion is not supported at any level of nesting and generates the following error message:

```
(FOC36249) RECURSIVE -INCLUDES ARE NOT ALLOWED
```

Reference Error Messages for Nested -INCLUDE Commands

(FOC36249) RECURSIVE -INCLUDES ARE NOT ALLOWED

The -INCLUDE dialogue manager directive may not include the same file recursively (either directly or indirectly).

NF797: Field-Based Reformatting

With field-based reformatting you can apply different formats to each row in a single report column by using a field to identify the format that applies to each row. For example, you can use this technique to apply the appropriate decimal currency formats when each row represents a different country. For example, Japan uses no decimal places while the United States uses two decimal places.

The field that contains the format specifications can be a real field in the data source or a temporary field created with a DEFINE command, a DEFINE in the Master File, or a COMPUTE command. If it is created with a COMPUTE command, the command must appear in the request prior to using the calculated field for reformatting.

Using Field-Based Formatting

The field that contains the formats must be alphanumeric and be at least eight characters in length. Only the first eight characters are used for formatting.

The field-based format may specify a length longer than the length of the original field. However, if the new length is more than one-third larger than the original length, the report column width may not be large enough to hold the value (indicated by asterisks in the field).

You can apply a field-based format to any type of field. However, the new format must be compatible with the original format:

- A numeric field can be reformatted to any other numeric format with any edit format options.
- An alphanumeric field can be reformatted to a different length.

- Any date field can be reformatted to any other date format type.
- Any date-time field can be reformatted to any other date-time format.

If the field-based format is invalid or specifies an impermissible type conversion, the field displays with plus signs (+++++) on the report output.

Syntax How to Define and Apply a Format Field

You can define the format field as follows:

- With a DEFINE command:

```
DEFINE FILE filename  
format_field/A8 = expression;  
END
```

- In a Master File:

```
DEFINE format_field/A8 = expression; $
```

- In a request:

```
COMPUTE format_field/A8 = expression;
```

where:

format_field

Is the name of the field that contains the format for each row.

expression

Is the expression that assigns the format values to the format field.

Once the format field is defined, you can apply it in a report request:

```
TABLE FILE filename  
display fieldname/format_field[/just]  
END
```

where:

display

Is any valid display command.

fieldname

Is a field in the request to be reformatted.

format_field

Is the name of the field that contains the formats. If the name of the format field is the same as an explicit format, the explicit format will be used. For example, a field named I8 cannot be used for field-based reformatting because it will be interpreted as the explicit format I8.

just

Is a justification option, L, R, or C. The justification option can be placed before or after the format field, separated from the format by a slash.

Example Displaying Different Decimal Places for Currency Values

```
DEFINE FILE CAR
CFORMAT/A8 = DECODE COUNTRY('ENGLAND' 'D10.1' 'JAPAN' 'D10' ELSE
'D10.2');
END
```

```
TABLE FILE CAR
SUM SALES/CFORMAT/C DEALER_COST/CFORMAT
BY COUNTRY
END
```


The output is:

COUNTRY	SALES	DEALER_COST
-----	-----	-----
ENGLAND	12,000.0	37,853.0
FRANCE	.00	4,631.00
ITALY	30,200.00	41,235.00
JAPAN	78,030	5,512
W GERMANY	88,190.00	54,563.00

Reference Usage Notes for Field-Based Reformatting

- Field-based reformatting is supported for TABLE and TABLEF. It works with StyleSheets, joins, and for any type of data source.
- Field-based reformatting is not supported for MODIFY, Maintain, MATCH, GRAPH, RECAP, FOOTING, HEADING, or text fields.
- Although you can use a DEFINE or COMPUTE command to create the format field, you *cannot* apply a field-based format to a calculated or virtual field.
- Field-based reformatting cannot be used on a BY sort field. It does work with an ACROSS field.
- If a report column is produced using field-based reformatting, the format used for a total or subtotal of the column will be taken from the previous detail line.
- Explicit reformatting creates two display fields internally for each field that is reformatted. Field-based reformatting creates three display fields.

- Field-based reformatting works for alphanumeric fields in a HOLD file, although three fields will be stored in the file for each field that is reformatted. To prevent the extra fields from being propagated to the HOLD file, specify SET HOLDLIST=PRINTONLY.
- If the number of decimal places varies between rows, the decimal points will not be aligned in the report output.

NF801: DB2 Data Adapter SET SSID Command for MSO

If the CAF option for the DB2 Data Adapter is installed at your site, you must indicate which DB2 subsystem you intend to use. The name of the DB2 subsystem may differ from the default, or your site may have multiple copies of DB2. To specify the DB2 subsystem-ID (SSID), issue the SET SSID command before executing a request. This command is supported for DB2 Version 5 and higher.

Syntax How to Dynamically Change the DB2 Subsystem ID

```
SQL [DB2] SET SSID ssid
```

where:

ssid

Is the DB2 subsystem ID; the default is DSN, unless your site changed the default at installation time. Omit the DB2 target RDBMS qualifier if you previously issued the SET SQLENGINE command for DB2.

To reset the SSID to the installation default, issue the command with a blank *ssid* value.

Reference Usage Notes for the SQL DB2 SET SSID Command

- The subsystem ID remains in effect for the duration of the session unless it is issued from a global profile or overridden by a subsequent SET SSID command.
- The plan associated with the MSO Data Adapter for DB2 must be bound to *all* DB2 subsystems that will be referenced.
- The DB2 Data Adapter must be installed with the CAF option.

- The data adapter may have been installed with a default, site-specific, SSID setting. Use the SQL ? query command to display this setting.
- The data adapter does not check whether the SSID you specified in the command is valid. If you specify an invalid SSID, DB2 will return an error, which will then generate the following messages:

```
(FOC1400)  SQLCODE IS %1 (HEX: %2) %3%4
```

This message indicates an error at execution of an SQL operation. It contains the SQL return code returned by the RDBMS and is usually accompanied by appropriate FOCUS error messages. For additional information about SQL return codes, refer to the RDBMS manual.

```
(FOC1456)  CAF: SPECIFIED DB2 SSID NOT FOUND %1%2%3%4
```

During an attempt to allocate a thread to DB2, the most recently specified subsystem name could not be located. Determine the correct subsystem name, and use the SQL DB2 SET SSID command to change the current setting. If a nonexistent subsystem is the default, the Interface should be reinstalled.

Example Dynamically Changing the DB2 Subsystem ID

```
SQL DB2 SET SSID DSNX
```

Example Querying the DB2 Data Adapter Settings

```
SQL DB2 ?
```

Information about all of the data adapter settings is returned. You may have to page down (using PF8 on MVS) to see every option.

The following line of output shows the Subsystem ID setting:

```
(FOC1447) SSID FOR CALL ATTACH IS          -   : DSNX
```

Example Restoring the DB2 Subsystem ID to the Installation Default

```
SQL DB2 SET SSID
```

NF802: Long Master File Names

Master File names for FOCUS, relational, and fixed format sequential data sources can be up to 64 characters long on OS/390. Except where noted, this length is supported in all functional areas that reference a Master File.

Master Files with long names can also be created by issuing the HOLD command with an AS phrase that specifies a long name.

Using Long Names on OS/390

In the OS/390 environment, file and member names are limited to eight characters. Therefore, longer Master File names are assigned eight-character names to be used when interacting with the operating system. Three new enhancements have been implemented in order to enable this feature on OS/390:

- A LONGNAME option for the DYNAM ALLOCATE command, which creates the long Master File name and performs the allocation. This DYNAM option is described in [How to Allocate a Long Master File Name in OS/390.](#)
- An eight-character naming convention for member names associated with long Master File names. This convention is described in [Member Names for Long Master File Names in OS/390.](#)
- A long Master File attribute, \$ VIRT, which contains the long name to be used when interacting with the Master File and the operating system. This attribute is described in [How a Long Master File Name is Implemented in OS/390.](#)

Member Names for Long Master File Names in OS/390

The DYNAM ALLOC command with the LONGNAME option automatically creates a member for the long Master File name in the PDS allocated to ddname HOLDMAST.

The member name consists of three parts: a prefix consisting of the leftmost characters from the long name, followed by a left brace character ({), followed by an index number. This naming convention is in effect for all long Master Files allocated using DYNAM or created using the HOLD command. The length of the prefix depends on how many long names have a common set of leftmost characters:

- The first ten names that share six or more leftmost characters have a six-character prefix and a one-character index number, starting from zero.
- Starting with the eleventh long name that shares the same leftmost six characters, the prefix becomes five characters, and the index number becomes two characters, starting from 00.

This process can continue until the prefix is one character and the index number is six characters. If you delete one of these members from the HOLDMAST PDS, the member name will be reused for the next new long name with the same prefix.

Example Long Master File Names and Corresponding Member Names

The following table lists sample long names with the corresponding member names that would be assigned under OS/390.

Long Name	Member Name
EMPLOYEES_ACCOUNTING	EMPLOY{ 0
EMPLOYEES_DEVELOPMENT	EMPLOY{ 1
EMPLOYEES_DISTRIBUTION	EMPLOY{ 2
EMPLOYEES_FINANCE	EMPLOY{ 3
EMPLOYEES_INTERNATIONAL	EMPLOY{ 4
EMPLOYEES_MARKETING	EMPLOY{ 5
EMPLOYEES_OPERATIONS	EMPLOY{ 6
EMPLOYEES_PERSONNEL	EMPLOY{ 7
EMPLOYEES_PUBLICATIONS	EMPLOY{ 8
EMPLOYEES_RESEARCH	EMPLOY{ 9
EMPLOYEES_SALES	EMPLO{ 00
EMPLOYEES_SUPPORT	EMPLO{ 01

Syntax How a Long Master File Name is Implemented in OS/390

To relate the short name to its corresponding long name, the first line of a long Master File contains the following attribute:

```
$ VIRT=long_filename
```

where:

long_filename

Is the long name, up to 64 characters.

Syntax How to Allocate a Long Master File Name in OS/390

```
DYNAM ALLOC DD ddname LONGNAME long_filename DS physical_filename
```

where:

ddname

Is the one- to eight-character member name of the Master File. It must be an existing member of a PDS allocated to DD MASTER.

long_filename

Is the long Master File name. The DYNAM command creates a copy of the short Master File in the PDS allocated to DD HOLDMAST. The member in HOLDMAST conforms to the eight character naming convention for long names. The Master File has the \$ VIRT attribute on the top line, which contains the long name.

Note: The copy, not the member *ddname*, is the Master File used when you reference the long name in a request.

physical_filename

Is the data set name of the FOCUS or fixed format sequential data source.

After you have allocated the long name, you can reference the data source using the long Master File name or the short ddname.

Syntax **How to Free an Allocation for a Long Master File Name**

```
DYNAM FREE LONGNAME long_filename
```

where:

long_filename

Is the long Master File name.

After issuing the DYNAM FREE LONGNAME command, you can no longer reference the data source using the long Master File name. However, you can reference it using the short ddname that was specified in the DYNAM ALLOC command.

Example **Using a Long Master File Name on OS/390**

To reference the EMPLOYEE data source as EMPLOYEE_DATA, dynamically allocate the long name:

```
DYNAM ALLOC DD EMPLOYEE LONGNAME EMPLOYEE_DATA -  
  DS USER1.EMPLOYEE.FOCUS SHR REU
```

You can now issue a request using the long name:

```
TABLE FILE EMPLOYEE_DATA  
PRINT CURR_SAL  
BY LAST_NAME BY FIRST_NAME  
END
```

The output is:

LAST_NAME	FIRST_NAME	CURR_SAL
-----	-----	-----
BANNING	JOHN	\$29,710.00
BLACKWOOD	ROSEMARIE	\$21,790.00
CROSS	BARBARA	\$27,072.00
GREENSPAN	MARY	\$9,010.00
IRVING	JOAN	\$26,872.00
JONES	DIANE	\$18,490.00
MCCOY	JOHN	\$18,490.00
MCKNIGHT	ROGER	\$16,110.00
ROMANS	ANTHONY	\$21,130.00
SMITH	MARY	\$13,210.00
	RICHARD	\$9,510.00
STEVENS	ALFRED	\$11,010.00

In this example, the long Master File will exist in the HOLDMAST PDS as member EMPLOY{0. The index number after the bracket depends on the number of existing long Master Files containing the same first six leftmost characters. The content of the EMPLOYEE_DATA Master File is virtually identical to the short Master File used in the allocation. The only difference is the \$ VIRT keyword on line one, which contains the long name. The FILENAME parameter also contains the long name, up to 64 characters.

```
$ VIRT=EMPLOYEE_DATA
$ Created from EMPLOYEE      MASTER
FILENAME=EMPLOYEE_DATA,
SUFFIX=FOC
SEGNAME=EMPINFO,  SEGTYPE=S1
  FIELDNAME=EMP_ID,      ALIAS=EID,      FORMAT=A9,      $
  FIELDNAME=LAST_NAME,  ALIAS=LN,      FORMAT=A15,     $
.
.
.
```

Creating a HOLD Master File With a Long Name on OS/390

If you use the HOLD command to create a FOCUS or fixed format sequential data source with a long name, a long member name will be generated for the accompanying Master File. As with the DYNAM command, the long member name will conform to the eight character naming convention for long file names. To relate the long name to the short member name, the \$ VIRT attribute will be generated on the top line in the Master File.

Note: The resulting HOLD file will be a temporary data file. To allocate the long Master File name to a permanent data file, issue the DYNAM command prior to the HOLD request. The ddname in the command must refer to an existing member of the MASTER PDS.

Creating RDBMS Tables With Long Master File Names

You can use the HOLD command to create an RDBMS table if you have the appropriate Write data adapter installed and have authority to create tables. For example, with the DB2 Data Adapter, you can issue the HOLD FORMAT DB2 command.

If the HOLD command includes a long AS name, both the Master and Access File names will be long. On OS/390, the Master and Access Files will be named according to the procedure described in [Using Long Names on OS/390](#). The short names assigned to corresponding Master and Access Files will be the same.

The AS name also becomes the table name and is specified in the Access File. If the AS name specified in the HOLD command is longer than the table name length supported by the RDBMS, the table cannot be created.

Reference Maximum Name Lengths for RDBMS Tables

The following table shows maximum name length supported by each RDBMS:

RDBMS	Maximum Table Name Length
DB2	18
Oracle 7, 8, 8i	30
Teradata	30

Example Creating a DB2 Table With a Long Name

The following request creates a 15 character DB2 table named EMPLOYEEINFODB2 (18 is the maximum table name length for DB2):

```
TABLE FILE EMPLOYEE
PRINT EMP_ID CURR_SAL
BY DEPARTMENT
BY LAST_NAME
BY FIRST_NAME
ON TABLE HOLD AS USER1.EMPLOYEEINFODB2 FORMAT DB2
END
```

This request creates the following Master File:

```
$ VIRT=EMPLOYEEINFODB2
```

```
FILE=EMPLOYEEINFODB2          , SUFFIX=SQL
SEGNAME=SEG01          , SEGTYPE=S0
FIELDNAME   ='DEPARTMENT'      , 'DPT'          , A10          , A10          , $
FIELDNAME   ='LAST_NAME'       , 'LN'          , A15          , A15          , $
FIELDNAME   ='FIRST_NAME'      , 'FN'          , A10          , A10          , $
FIELDNAME   =FOCLIST           , FOCLIST       , I5           , I4           , $
FIELDNAME   ='EMP_ID'          , 'EID'         , A9           , A9           , $
FIELDNAME   ='CURR_SAL'        , 'CSAL'        , D12.2M       , D8           , $
```

This request also creates the following Access File:

```
$ VIRT=EMPLOYEEINFODB2
SEGNAME=SEG01          ,
TABLENAME=USER1.EMPLOYEEINFODB2
KEYS=04          , WRITE=YES, $
```

Note that the AS name is also the table name.

Consider what happens when the AS name is longer than the 18 characters supported for table names in DB2 on OS/390:

```
TABLE FILE EMPLOYEE
PRINT EMP_ID CURR_SAL
BY DEPARTMENT
BY LAST_NAME
BY FIRST_NAME
ON TABLE HOLD AS EMPLOYEEINFORMATIONDB2 FORMAT DB2
END
```

Running this request generates the following messages:

```
>    NUMBER OF RECORDS IN TABLE=          12    LINES=          12
```

```
    HOLDING SQL      FILE...
(FOC1400) SQLCODE IS -107 (HEX: FFFFFFF95)
(FOC1414) EXECUTE IMMEDIATE ERROR.
```

In this example, the Master and Access Files are created, however, the table cannot be created because the table name specified in the Access File is too long and, therefore, invalid. Note that you will get a more descriptive message if you issue the following command:

```
SQL DB2 SET ERRORTYPE DBMS
```

For example:

```
(FOC1400) SQLCODE IS -107 (HEX: FFFFFFF95)
:  DSNT408I SQLCODE = -107, ERROR:  THE NAME EMPLOYEEINFORMATIONDB2 IS
TOO
:
:      LONG.  MAXIMUM ALLOWABLE SIZE IS 18
:  DSNT418I SQLSTATE   = 42622 SQLSTATE RETURN CODE
:  DSNT415I SQLERRP    = DSNHSMUD SQL PROCEDURE DETECTING ERROR
:  DSNT416I SQLERRD    = 0 0 0 -1 15 0 SQL DIAGNOSTIC INFORMATION
:  DSNT416I SQLERRD    = X'00000000' X'00000000' X'00000000'
:      X'FFFFFFFF' X'0000000F' X'00000000' SQL DIAGNOSTIC
:      INFORMATION
(FOC1414) EXECUTE IMMEDIATE ERROR.
```

Reference Usage Notes for Long Master File Names

- The FOCUS Database Server (SU) is not supported on any platform.
- The DATASET attribute is not supported in a long Master File.
- The ACCESSFILE attribute is not supported with long Master Files.

- An External index is not supported.
- The LONGNAME option of the DYNAM command may only be issued from within a FOCEXEC or RPC. It cannot be used to pre-allocate long Master Files in JCL or CLISTS on OS/390.
- Long Master Files are not designed to be edited on OS/390. Each time the DYNAM command is issued with the LONGNAME attribute; it overlays the existing member in HOLDMAST. You must make any edits (such as the addition of fields or DBA attributes, or use of the REBUILD utility) to an existing short Master File.
- ? FDT and ? FILE *longfilename* will show an internal DD alias of @000000*n*, where *n* is less than or equal to the number of existing long file allocations. Use this internal DDNAME in all queries that require a valid DDNAME, such as ? TSO DDNAME queries or USE commands (OS/390 only).
- VM is not supported.
- Fusion is not supported.

Reference Error Messages for Long Master File Names

(FOC1982) UNABLE TO FIND LONGNAME %1

NF817: Creating Comma-Delimited Files

Formats COMMA, COM and COMT give you a choice of comma-delimited file formats for your report output. A comma-delimited file is a sequential data source in which data values are separated by commas. In the output file, all character values are enclosed in double quotation marks. In addition, you can choose to:

- Remove leading blanks from numeric fields and trailing blanks from alphanumeric fields, so that only significant data is propagated to the output file.
- Propagate only the data values to the output file or include the column headings as the first record in the output file.

Single or double quotation marks are supported in character fields. Double quotation marks within a character value are stored as two consecutive double quotation marks.

Types of Comma-Delimited Output Files

The differences between format COMMA, COM, and COMT output files are summarized in the following table:

Format Name	Remove non-significant blanks?	Create Master File?	Suffix in Master File	Extension or Filetype
COMMA	No	No	N/A	PRN
COM	Yes	Yes	COM	CSV
COMT	Yes	Yes	COMT	CSV

Note:

- Format COMMA saves the data values as a variable-length text file with fields separated by commas and with character values enclosed in double quotation marks. All blanks within fields are retained. This format is the industry standard comma-delimited format.
- Format COM saves the data values as a variable-length text file with fields separated by commas and with character values enclosed in double quotation marks. Leading blanks are removed from numeric fields and trailing blanks are removed from character fields. To issue a request against this data source, the setting PCOMMA=ON is required.
- Format COMT saves the column headings in the first row of the output file. It produces a variable-length text file with fields separated by commas and with character values enclosed in double quotation marks. Leading blanks are removed from numeric fields and trailing blanks are removed from character fields. This format is required by certain software packages such as Microsoft Access.

A Master File is created for format COM and COMT when the command used to create the output file is HOLD. The SUFFIX in the generated Master File is COM or COMT.

All values are stored in their actual formats. The following display options are propagated to the output file: leading zeros, zero suppression, and scientific notation. Master file formats generated are exactly as in FORMAT ALPHA.

Syntax How to Save Report Output in Comma-Delimited Format

```
[ON TABLE] command [AS filename] FORMAT comma_format
```

where:

ON TABLE

Is the syntax for creating an output file within a TABLE request.

command

Can be one of the following:

HOLD creates a Master File to accompany a FORMAT COM or COMT output file. For format COMMA, no accompanying Master File is created.

PCHOLD is used to automatically send the output file to a client application when issued in an environment that supports automatic file transfers.

SAVE creates an output file with no accompanying Master File.

filename

Is the file name of the resulting output file on VM, UNIX, or NT, or the ddname on OS/390.

comma_format

COMMA creates a comma-delimited variable-length text file containing the data values from the report request. All character values are enclosed in double quotation marks. Corresponding columns in each record are the same length. On VM, the filetype is PRN. On UNIX and Windows NT, the extension is .prn. **Note:** No Master File is created to accompany this output file.

COM creates a comma-delimited variable-length text file containing the data values from the report request. All character values are enclosed in double quotation marks. Leading blanks are stripped from numeric fields (format codes D, F, I, or P) and trailing blanks are stripped from character fields (format code A). Corresponding columns in each record may have different lengths because of the removal of leading and trailing blanks. On VM, the filetype is CSV. On UNIX and Windows NT, the extension is .csv.

Note: A Master File is created if the HOLD command is used. In the accompanying Master File, the SUFFIX value is COM. The setting PCOMMA=ON is required in order to interpret the character fields correctly in a request. With PCOMMA=OFF (the default), double quotation marks are considered characters within the field, not delimiters around the field.

COMT creates a comma-delimited variable-length text file containing the column headings and data values from the report request. All character values are enclosed in double quotation marks. Leading blanks are stripped from numeric fields (format codes D, F, I, or P) and trailing blanks are stripped from character fields (format code A). Corresponding columns in each record may have different lengths because of the removal of leading and trailing blanks. On VM, the filetype is CSV. On UNIX and Windows NT, the extension is .csv. **Note:** A Master File is created if the HOLD command is used. In the accompanying Master File, the SUFFIX value is COMT.

Reference Usage Notes for Comma-Delimited Output Files

- There is an 8K overhead for processing comma-delimited files using HOLD FORMAT COM or COMT. Therefore, extract files created by HOLD FORMAT COM | COMT are limited to 26K record lengths.

- You must be aware of the formats and lengths supported by the application for which you are creating the output file. Field lengths created by the HOLD or SAVE command are those supported as USAGE formats in a Master File. You must take into account any limits of the destination application.
- The setting PCOMMA=ON is required in order to interpret the character fields created by HOLD FORMAT COM correctly in a request. With PCOMMA=OFF (the default), double quotation marks are considered characters within the field, not delimiters around the field.
- If you use field-based reformatting in the request that creates the output file, the field lengths in the output file are the lengths from the original Master File or DEFINE command.
- If the request that creates the output file retrieves missing data described with MISSING=ON in the original Master File, the output file will contain a blank if the original field was alphanumeric, or a zero if the field was numeric.
- As with all HOLD files, column headings specified with an AS phrase are ignored unless you set ASNAMES to ON. When ASNAMES is set ON, the value from the AS phrase, up to but not including the comma, becomes the field name in the HOLD Master File.
- Regardless of the ASNAMES setting, the column heading in the COMT data file is the value of the AS phrase exactly as specified in the request.
- The SAVB command is not supported. The output file is a text file.
- The OVER phrase is not supported in a request that creates a COMMA, COM, or COMT format output file.

- Smart date fields and dates formatted as I or P fields with date format options are treated as numeric and are not enclosed in double quotation marks in the output file. Dates formatted as alphanumeric fields with date format options are treated as alphanumeric and enclosed in double quotation marks.
- Continental decimal notation (CDN=ON|SPACE|QUOTE) is not supported. A comma within a number would be interpreted as two separate columns by a destination application such as Microsoft Access.
- Text fields are not supported.
- There is a 32K record length limit in the output file
- Blank fieldnames will show up as blank column titles. This may result in an error when attempting to use the file as input to various applications.
- A double-precision number expressed in scientific notation is stored with the character D before the exponent. For example, the command PRINT RETAIL_COST/D9.3E prints the values in the following form: 0.888D+04. Some applications may not understand this value, as they generally expect an E before the exponent. Printing the value as single precision floating point instead of double precision produces a value with an E before the exponent. For example, format F9.3E produces the value 0.888E+04.

Example Creating a Comma-Delimited File With Leading and Trailing Blanks

```
TABLE FILE MOVIES
PRINT COPIES TITLE WHOLESALER AS 'WHOLESALE,PRICE'
BY CATEGORY
WHERE CATEGORY EQ 'ACTION' OR 'CHILDREN'
ON TABLE HOLD AS COMMAH FORMAT COMMA
END
```

Leading blanks are retained in numeric fields and trailing blanks are retained in character fields in the COMMAH output file:

```
"ACTION " , 2 , "JAWS" , 10.99
"ACTION " , 3 , "ROBOCOP" , 11.50
"ACTION " , 4 , "TOTAL RECALL" , 11.99
"ACTION " , 2 , "TOP GUN" , 9.99
"ACTION " , 3 , "RAMBO III" , 10.99
"CHILDREN" , 1 , "SMURFS, THE" , 10.00
"CHILDREN" , 2 , "SHAGGY DOG, THE" , 29.99
"CHILDREN" , 1 , "SCOOPY-DOO-A DOG IN THE RUFF" , 9.75
"CHILDREN" , 2 , "ALICE IN WONDERLAND" , 12.50
"CHILDREN" , 1 , "SESAME STREET-BEDTIME STORIES AND SONGS" , 7.65
"CHILDREN" , 1 , "ROMPER ROOM-ASK MISS MOLLY" , 7.99
"CHILDREN" , 1 , "SLEEPING BEAUTY" , 15.99
"CHILDREN" , 3 , "BAMBI" , 12.00
```

No Master File is created for use with this output file.

Example Creating a Compressed Comma-Delimited File Without Column Headings

```
TABLE FILE MOVIES
PRINT COPIES TITLE WHOLESALER AS 'WHOLESALE,PRICE'
BY CATEGORY
WHERE CATEGORY EQ 'ACTION' OR 'CHILDREN'
  ON TABLE SAVE AS COMH FORMAT COM
END
```

Leading blanks are removed from numeric fields and trailing blanks are removed from character fields in the COMH output file:

```
"ACTION",2,"JAWS",10.99
"ACTION",3,"ROBOCOP",11.50
"ACTION",4,"TOTAL RECALL",11.99
"ACTION",2,"TOP GUN",9.99
"ACTION",3,"RAMBO III",10.99
"CHILDREN",1,"SMURFS, THE",10.00
"CHILDREN",2,"SHAGGY DOG, THE",29.99
"CHILDREN",1,"SCOOPY-DOO-A DOG IN THE RUFF",9.75
"CHILDREN",2,"ALICE IN WONDERLAND",12.50
"CHILDREN",1,"SESAME STREET-BEDTIME STORIES AND SONGS",7.65
"CHILDREN",1,"ROMPER ROOM-ASK MISS MOLLY",7.99
"CHILDREN",1,"SLEEPING BEAUTY",15.99
"CHILDREN",3,"BAMBI",12.00
```

No Master File is created for use with this output file because the SAVE command was used. The HOLD command would generate an accompanying Master File.

Example Creating a Compressed Comma-Delimited File With Column Headings

```
TABLE FILE MOVIES
PRINT COPIES TITLE WHOLESALPR AS 'WHOLESALE,PRICE'
BY CATEGORY
WHERE CATEGORY EQ 'ACTION' OR 'CHILDREN'
      ON TABLE HOLD AS COMTH FORMAT COMT
END
```

Leading blanks are removed from numeric fields and trailing blanks are removed from character fields in the COMTH output file, and the first row contains column headings. The AS phrase becomes the column heading for the WHOLESALPR field regardless of the ASNAMES setting:

```
"CATEGORY", "COPIES", "TITLE", "WHOLESALE,PRICE"
"ACTION", 2, "JAWS", 10.99
"ACTION", 3, "ROBOCOP", 11.50
"ACTION", 4, "TOTAL RECALL", 11.99
"ACTION", 2, "TOP GUN", 9.99
"ACTION", 3, "RAMBO III", 10.99
"CHILDREN", 1, "SMURFS, THE", 10.00
"CHILDREN", 2, "SHAGGY DOG, THE", 29.99
"CHILDREN", 1, "SCOOPY-DOO-A DOG IN THE RUFF", 9.75
"CHILDREN", 2, "ALICE IN WONDERLAND", 12.50
"CHILDREN", 1, "SESAME STREET-BEDTIME STORIES AND SONGS", 7.65
"CHILDREN", 1, "ROMPER ROOM-ASK MISS MOLLY", 7.99
"CHILDREN", 1, "SLEEPING BEAUTY", 15.99
"CHILDREN", 3, "BAMBI", 12.00
```

With ASNAMES set to OFF, the COMTH Master File is:

```
FILE=COMTH                ,SUFFIX=COMT
SEGNAME=COMTH             ,SEGTYPE=S01
FIELDNAME  =CATEGORY      ,E01          ,A8          ,A08          , $
FIELDNAME  =COPIES        ,E02          ,I3          ,A03          , $
FIELDNAME  =TITLE         ,E03          ,A39         ,A39          , $
FIELDNAME  =WHOLESALEPR   ,E04          ,F6.2        ,A06          , $
```

With ASNAMES set to ON, the COMTH Master File is:

```
FILE=COMTH                ,SUFFIX=COMT
SEGNAME=COMTH             ,SEGTYPE=S01
FIELDNAME  =CATEGORY      ,E01          ,A8          ,A08          , $
FIELDNAME  =COPIES        ,E02          ,I3          ,A03          , $
FIELDNAME  =TITLE         ,E03          ,A39         ,A39          , $
FIELDNAME  =WHOLESALE     ,E04          ,F6.2        ,A06          , $
```

Example Using Date Formats With HOLD FORMAT COMT

The following request prints the date field RELDATE (format YMD) and computes the following fields:

- IDATE, format I6YMD.
- PDATE, format P6YMD.
- ADATE, format A6YMD.

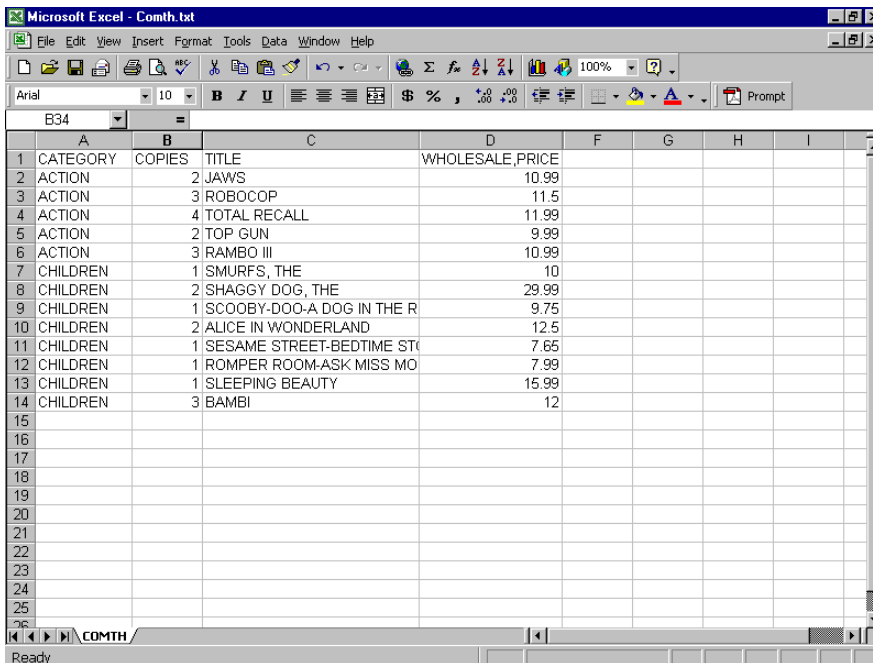
```
TABLE FILE MOVIES
  PRINT TITLE RELDATE
  COMPUTE
    IDATE/I6YMD = RELDATE;
    PDATE/P6YMD = RELDATE;
    ADATE/A6YMD = RELDATE;
  BY CATEGORY
  WHERE CATEGORY EQ 'ACTION'
    ON TABLE HOLD AS COMTH FORMAT COMT
  END
```

In the output file, only ADATE is enclosed in double quotation marks:

```
"CATEGORY", "TITLE", "RELDATE", "IDATE", "PDATE", "ADATE"
"ACTION", "JAWS", 780513, 780513, 780513, "780513"
"ACTION", "ROBOCOP", 880603, 880603, 880603, "880603"
"ACTION", "TOTAL RECALL", 910324, 910324, 910324, "910324"
"ACTION", "TOP GUN", 880124, 880124, 880124, "880124"
"ACTION", "RAMBO III", 891216, 891216, 891216, "891216"
```

Example Opening a Format COMT File in Microsoft Excel

After transferring the COMTH file created in [Creating a Compressed Comma-Delimited File With Column Headings](#) to the PC using FTP, you can open it in a Microsoft Application such as Excel or Access:



	A	B	C	D	F	G	H	I
1	CATEGORY	COPIES	TITLE	WHOLESAL PRICE				
2	ACTION	2	JAWS	10.99				
3	ACTION	3	ROBOCOP	11.5				
4	ACTION	4	TOTAL RECALL	11.99				
5	ACTION	2	TOP GUN	9.99				
6	ACTION	3	RAMBO III	10.99				
7	CHILDREN	1	SMURFS, THE	10				
8	CHILDREN	2	SHAGGY DOG, THE	29.99				
9	CHILDREN	1	SCOOBY-DOO-A DOG IN THE R	9.75				
10	CHILDREN	2	ALICE IN WONDERLAND	12.5				
11	CHILDREN	1	SESAME STREET-BEDTIME ST	7.65				
12	CHILDREN	1	ROMPER ROOM-ASK MISS MO	7.99				
13	CHILDREN	1	SLEEPING BEAUTY	15.99				
14	CHILDREN	3	BAMBI	12				
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								

Excel recognizes the data as comma-delimited. You may need to size the columns.

NF824: STRIP Subroutine

The STRIP subroutine removes all occurrences of a specific character from an input string. The resulting string has the same length as the original string but is padded on the right with blanks.

Syntax **How to Remove All Occurrences of a Character From an Input String**

STRIP(length, source_string, strip_char, result)

where:

length

Is a number or numeric field that specifies the length of the source and result strings.

source_string

Is an alphanumeric string or field from which the character will be removed. Text fields are not supported.

strip_char

Is an alphanumeric literal or field that specifies the single character to be removed from the source string. If it is a literal, it must be enclosed in single quotation marks. If it is a field, the left-most character in the field will be used as the strip character.

result

Is the name of the alphanumeric output field or its format enclosed in single quotation marks.

Note: In Dialogue Manager, ampers variables will have the length specified by the result string.

Example Removing All Occurrences of a Character From a String

The following example removes all occurrences of a period (.) from director names in the comedy category of the MOVIES data source:

```
TABLE FILE MOVIES
PRINT DIRECTOR AND COMPUTE
SDIR/A17 = STRIP(17,DIRECTOR,'.','A17');
WHERE CATEGORY EQ 'COMEDY'
END
```

The output is:

DIRECTOR	SDIR
-----	----
ZEMECKIS R.	ZEMECKIS R
ABRAHAMS J.	ABRAHAMS J
ALLEN W.	ALLEN W
HALLSTROM L.	HALLSTROM L
MARSHALL P.	MARSHALL P
BROOKS J.L.	BROOKS JL

Example Removing Single Quotation Marks From a String

To specify a single quotation mark, use two consecutive single quotation marks. You must then enclose this character combination in single quotation marks:

```
TABLE FILE MOVIES
PRINT TITLE AND COMPUTE
STITLE/A39 = STRIP(39,TITLE,'''','A39');
WHERE TITLE CONTAINS '''
END
```

The output is:

TITLE

BABETTE'S FEAST

JANE FONDA'S COMPLETE WORKOUT

JANE FONDA'S NEW WORKOUT

MICKEY MANTLE'S BASEBALL TIPS

STITLE

BABETTES FEAST

JANE FONDAS COMPLETE WORKOUT

JANE FONDAS NEW WORKOUT

MICKEY MANTLES BASEBALL TIPS

NF825: SET PCOMMA

By default, when a Master File specifies SUFFIX=COM, incoming alphanumeric values are not enclosed in double quotation marks, and each record is terminated with a comma and dollar sign (,\$) character combination. This format does not support retrieval of most comma-delimited files produced by PC applications. A comma-delimited file is a sequential data source in which the data values are separated by commas.

Setting PCOMMA to ON indicates that alphanumeric data will be enclosed in double quotation marks and that each record will be terminated with a carriage return and line feed (crLf). This setting supports retrieval of comma-delimited files created by PC applications and by the HOLD FORMAT COM command.

Syntax **How to Retrieve PC-Type Comma-Delimited Data Sources**

`SET PCOMMA = {ON|OFF}`

or, in a TABLE request

`ON TABLE SET PCOMMA {ON|OFF}`

where:

ON

Supports retrieval of comma-delimited data sources in which alphanumeric data is enclosed in double quotation marks and in which each record is terminated with a carriage return and line feed.

OFF

Supports retrieval of comma-delimited data sources in which alphanumeric data is not enclosed in double quotation marks and in which each record is terminated with a comma and dollar sign.

Example Reading a Comma-Delimited Data Source

The following request creates a comma-delimited output file with character values enclosed in double quotation marks:

```
TABLE FILE MOVIES
PRINT COPIES TITLE WHOLESALPR RELDATE
BY CATEGORY
WHERE CATEGORY EQ 'ACTION' OR 'CHILDREN'
      ON TABLE HOLD AS COMH FORMAT COM
END
```

The contents of the output file are:

```
"ACTION",2,"JAWS",10.99,780513
"ACTION",3,"ROBOCOP",11.50,880603
"ACTION",4,"TOTAL RECALL",11.99,910324
"ACTION",2,"TOP GUN",9.99,880124
"ACTION",3,"RAMBO III",10.99,891216
"CHILDREN",1,"SMURFS, THE",10.00,880216
"CHILDREN",2,"SHAGGY DOG, THE",29.99,590109
"CHILDREN",1,"SCOOBY-DOO-A DOG IN THE RUFF",9.75,880513
"CHILDREN",2,"ALICE IN WONDERLAND",12.50,510721
"CHILDREN",1,"SESAME STREET-BEDTIME STORIES AND SONGS",7.65,870904
"CHILDREN",1,"ROMPER ROOM-ASK MISS MOLLY",7.99,880723
"CHILDREN",1,"SLEEPING BEAUTY",15.99,750830
"CHILDREN",3,"BAMBI",12.00,420703
```

The following is a Master File that describes this output file:

```
FILE=COMH                      , SUFFIX=COM
SEGNAME=COMH                   , SEGTYPE=S01
FIELDNAME   =CATEGORY          ,E01           ,A8           ,A08           , $
FIELDNAME   =COPIES            ,E02           ,I3           ,A03           , $
FIELDNAME   =TITLE             ,E03           ,A39          ,A39           , $
FIELDNAME   =WHOLESALPR        ,E04           ,F6.2         ,A06           , $
FIELDNAME   =RELDATE           ,E05           ,YMD          ,A06           , $
```

The following request reads this comma-delimited output file:

```
SET PCOMMA = ON
TABLE FILE COMH
PRINT *
END
```

The output is:

CATEGORY	COPIES	TITLE	WHOLESALEPR	RELDATE
-----	-----		-----	-----
ACTION	2	JAWS	10.99	78/05/13
ACTION	3	ROBOCOP	11.50	88/06/03
ACTION	4	TOTAL RECALL	11.99	91/03/24
ACTION	2	TOP GUN	9.99	88/01/24
ACTION	3	RAMBO III	10.99	89/12/16
CHILDREN	1	SMURFS, THE	10.00	88/02/16
CHILDREN	2	SHAGGY DOG, THE	29.99	59/01/09
CHILDREN	1	SCOOPY-DOO-A DOG IN THE RUFF	9.75	88/05/13
CHILDREN	2	ALICE IN WONDERLAND	12.50	51/07/21
CHILDREN	1	SESAME STREET-BEDTIME STORIES AND SONGS	7.65	87/09/04
CHILDREN	1	ROMPER ROOM-ASK MISS MOLLY	7.99	88/07/23
CHILDREN	1	SLEEPING BEAUTY	15.99	75/08/30
CHILDREN	3	BAMBI	12.00	42/07/03

NF826: SQUEEZ Subroutine

The SQUEEZ subroutine reduces multiple contiguous blank characters within an input string to a single blank character. The resulting string has the same length as the original string but is padded on the right with blanks.

Syntax How to Reduce Multiple Blanks to a Single Blank

SQUEEZ(length, source_string, result)

where:

length

Is a number or numeric field that specifies the length of the source and result fields.

source_string

Is an alphanumeric string or field from which the extra blank characters will be removed. Text fields are not supported.

result

Is the name of the alphanumeric output field or its format enclosed in single quotation marks.

Note: In Dialogue Manager, amper variables will have the length specified by the result string.

Example Reducing Multiple Blanks to a Single Blank

The following request concatenates employee first names and last names into a field called NAME, retaining all blanks. It then uses the SQUEEZ subroutine to reduce multiple blanks within the name to a single blank:

```
DEFINE FILE EMPLOYEE
NAME/A30 = FIRST_NAME | LAST_NAME;
END
TABLE FILE EMPLOYEE
PRINT NAME AND COMPUTE
SQNAME/A30 = SQUEEZ(30,NAME,'A30');
WHERE DEPARTMENT EQ 'MIS'
END
```

The output is:

NAME	SQNAME
----	-----
MARY SMITH	MARY SMITH
DIANE JONES	DIANE JONES
JOHN MCCOY	JOHN MCCOY
ROSEMARIE BLACKWOOD	ROSEMARIE BLACKWOOD
MARY GREENSPAN	MARY GREENSPAN
BARBARA CROSS	BARBARA CROSS

NF827: TRIM Subroutine

The TRIM subroutine removes leading and/or trailing occurrences of a pattern within a string.

Syntax How to Remove Leading and Trailing Occurrences

```
TRIM(trim_where, string, string_length, pattern, pattern_length, result)
```

where:

trim_where

Alphanumeric

Indicates where to remove the pattern. Possible values are:

‘L’ Removes leading occurrences.

‘T’ Removes trailing occurrences.

‘B’ Removes both leading and trailing occurrences.

string

Alphanumeric

Is the source string. Text fields are not supported.

string_length

Integer

Is the length of the source string.

pattern

Alphanumeric

Is the pattern to remove.

pattern_length

Integer

Is the length of the pattern string.

result

Alphanumeric

Is the name of the alphanumeric output field or its format enclosed in single quotation marks.

Example Removing Leading Occurrences

The following request uses the TRIM subroutine to remove leading occurrences of the characters BR from director names in the MOVIES data source.

```
TABLE FILE MOVIES
PRINT  DIRECTOR AND
COMPUTE
    TRIMDIR/A17 = TRIM('L',DIRECTOR,17,'BR',2,'A17');
    WHERE DIRECTOR CONTAINS 'BR'
END
```

The output is:

DIRECTOR	TRIMDIR
-----	-----
ABRAHAMS J.	ABRAHAMS J.
BROOKS R.	OOKS R.
BROOKS J.L.	OOKS J.L.

Example Removing Trailing Occurrences

The following request removes trailing occurrences of the characters ER from the TITLE field in the MOVIES data source. In order to remove trailing non-blank characters, trailing blanks must be removed first. The TITLE field has trailing blanks. Therefore, the TRIM subroutine does not remove the characters ER when creating field TRIMT. The SHORT field does not have trailing blanks. Therefore, TRIM removes the trailing ER characters when creating field TRIMS:

```
DEFINE FILE MOVIES
SHORT/A19 = SUBSTR(19, TITLE, 1, 19, 19, SHORT);
END
TABLE FILE MOVIES
PRINT  TITLE   IN 1  AS 'TITLE: '
      SHORT   IN 40 AS 'SHORT: ' OVER
COMPUTE
  TRIMT/A39 = TRIM('T',TITLE,39,'ER',2,'A39'); IN 1 AS 'TRIMT: '
COMPUTE
  TRIMS/A19 = TRIM('T',SHORT,19,'ER',2,'A19'); IN 40 AS 'TRIMS: '
WHERE TITLE LIKE '%ER'
END
```

The output is:

TITLE:	LEARN TO SKI BETTER	SHORT:	LEARN TO SKI BETTER
TRIMT:	LEARN TO SKI BETTER	TRIMS:	LEARN TO SKI BETT
TITLE:	FANNY AND ALEXANDER	SHORT:	FANNY AND ALEXANDER
TRIMT:	FANNY AND ALEXANDER	TRIMS:	FANNY AND ALEXAND

NF828: SUFFIX = COM/COMT/TABT

Master Files for comma and tab-delimited sequential data sources can have SUFFIX values of COM, COMT, or TABT. Comma-delimited data sources are sequential data sources in which field values are separated by commas. Tab-delimited data sources are sequential data sources in which field values are separated by tabs.

Comma-delimited and tab-delimited data sources cannot participate in joins.

Accessing SUFFIX=COM Data Sources

A Master File containing the attribute SUFFIX=COM can be used to access two styles of comma-delimited sequential data sources:

- One style is consistent with prior releases. Character values are not enclosed in double quotation marks, and the comma-dollar sign character combination is the record terminator. With this style of comma-delimited data source, records can span multiple lines. A field that contains a comma as a character must be enclosed within single quotation marks.
- The second style is consistent with the current industry standard for comma-delimited data sources. Character values are enclosed in double quotation marks and the crlf (carriage-return, line-feed) character combination is the record terminator. In addition, each input record must be completely contained on a single input line. A double quotation mark within a field is identified by two consecutive double quotation marks.

Note that the setting PCOMMA=ON is required in conjunction with the SUFFIX=COM Master File when accessing this type of data source in order to correctly interpret the double quotation marks around character values. Without this setting, the double quotation marks are considered characters within the field, not delimiters enclosing the field values.

Accessing SUFFIX=COMT Data Sources

A Master File containing the attribute SUFFIX=COMT can be used to access comma-delimited sequential data sources in which all of the following conditions are met:

- The first record of the data source contains column titles. This record will be ignored when the data source is accessed in a request.
- Character values are enclosed in double quotation marks. A double quotation mark within a field is identified by two consecutive double quotation marks.
- Each record is completely contained on one line and terminated with the crlf character combination.

Accessing SUFFIX=TABT Data Sources

A Master File containing the attribute SUFFIX=TABT can be used to access tab-delimited sequential data sources in which all of the following conditions are met:

- The first record of the data source contains column titles. This record will be ignored when the data source is accessed in a request.
- Character values are not enclosed in double quotation marks.
- Each record is completely contained on one line and terminated with the crlf character combination.

NF829: AUTODATE for FOCUS Data Sources

Each segment of a FOCUS data source can have a timestamp field that records the date and time of the last change to the segment. This field can have any name, but its USAGE format must be AUTODATE. The field will be populated each time its segment instance is updated. The timestamp is stored as format HYYMDS and can be manipulated for reporting purposes using any of the date-time functions.

Creating and Using the AUTODATE Field

In each segment of a FOCUS data source, you can define a field with USAGE = AUTODATE. The AUTODATE field cannot be part of a key field for the segment. Therefore, if the SEGTYPE is S2, the AUTODATE field cannot be the first or second field defined in the segment.

The AUTODATE format specification is supported only for a real field in the Master File, not in a DEFINE or COMPUTE command or a DEFINE in the Master File. However, you can use a DEFINE or COMPUTE command to manipulate or reformat the value stored in the AUTODATE field.

After adding an AUTODATE field to a segment, you must REBUILD the data source. REBUILD will not timestamp the field. It will not have a value until a segment instance is inserted or updated.

If a user-written procedure updates the AUTODATE field, the user-specified value will be overwritten when the segment instance is written to the data source. No message is generated to inform the user that the value was overwritten.

The AUTODATE field can be indexed; however, it is recommended that you make sure that the index is necessary because of the overhead needed to keep the index up to date each time a segment instance changes.

If you create a HOLD file that contains the AUTODATE field, it will be propagated to the HOLD file as a date-time field with the format HYYMDS.

Syntax How to Define an AUTODATE Field for a Segment

```
FIELDNAME = name, ALIAS = alias, {USAGE|FORMAT} = AUTODATE , $
```

where:

name

Is any valid field name.

alias

Is any valid alias.

Example Defining an AUTODATE Field

The EMPDATE data source can be created by doing a REBUILD DUMP of the EMPLOYEE data source and a REBUILD LOAD into the EMPDATE data source. The Master File for EMPDATE is the same as the Master File for EMPLOYEE with the FILENAME changed and the DATECHK field added:

```
FILENAME=EMPDATE, SUFFIX=FOC
SEGNAME=EMPINFO, SEGTYPE=S1
FIELDNAME=EMP_ID, ALIAS=EID, FORMAT=A9, $
FIELDNAME=DATECHK, ALIAS=DATE, USAGE=AUTODATE, $
FIELDNAME=LAST_NAME, ALIAS=LN, FORMAT=A15, $
.
.
.
```

To add the timestamp information to EMPDATE, run the following procedure:

```
SET TESTDATE = 20010715
TABLE FILE EMPLOYEE
PRINT EMP_ID CURR_SAL
ON TABLE HOLD
END

MODIFY FILE EMPDATE
FIXFORM FROM HOLD
MATCH EMP_ID
ON MATCH COMPUTE CURR_SAL = CURR_SAL + 10;
ON MATCH UPDATE CURR_SAL
ON NOMATCH REJECT
DATA ON HOLD
END
```

You can then reference the AUTODATE field in a DEFINE or COMPUTE command, or display it using a display command. The following request computes the number of days difference between the date 7/31/2001 and the DATECHK field:

```
DEFINE FILE EMPLOYEE
DATE_NOW/HYYMD = DT(20010731);
DIFF_DAYS/D12.2 = HDIFF(DATE_NOW, DATECHK, 'DAY', 'D12.2');
END
TABLE FILE EMPDATE
PRINT DATECHK DIFF_DAYS
WHERE LAST_NAME EQ 'BANNING'
END
```

The output is:

DATECHK	DIFF_DAYS
-----	-----
2001/07/15 15:10:37	16.00

Reference Usage Notes for AUTODATE

- PRINT * and PRINT.SEG.*fld* will print the AUTODATE field.
- To display the AUTODATE field on a CRTFORM, Winform, or in FSCAN, you must explicitly reference the AUTODATE field name in the request. CRTFORM * will not display the field. CRTFORM always treats the AUTODATE field as a display only (D.) field.
- MODIFY FIXFORM and FREEFORM requests capture the system date/time per transaction.
- SU updates the AUTODATE field per segment using the date and time on the FOCUS Database Server.
- Maintain will process AUTODATE fields at COMMIT time.
- DBA is permitted on the AUTODATE field; however, when unrestricted fields in the segment are updated, the system will update the AUTODATE field.
- The AUTODATE field does not support the following attributes: MISSING, ACCEPT, and HELPMESSAGE.

NF833: Creating Tab-Delimited Files

Format TABT enables you to create tab-delimited output files. A tab-delimited file is a sequential data source in which the data values are separated by tabs. You can use the HOLD command to automatically generate an accompanying Master File, or use the SAVE command to generate just the output file.

Format TABT enables you to create tab-delimited output files in which leading blanks are removed from numeric fields and trailing blanks are removed from alphanumeric fields, so that only significant data is propagated to the output file. Column headings are included as the first record in the output file. Character values are *not* enclosed in double quotation marks.

A Master File is created for format TABT when the command used to create the output file is HOLD. The SUFFIX in the generated Master File is TABT.

All values are stored in their actual formats. The following display options are propagated to the output file: leading zeros, zero suppression, and scientific notation. Master file formats generated are exactly as in FORMAT ALPHA.

Syntax How to Save Report Output in Tab-Delimited Format

```
[ON TABLE] command [AS filename] FORMAT TABT
```

where:

`ON TABLE`

Is the syntax for creating an output file within a TABLE request.

command

Can be one of the following:

HOLD creates a Master File to accompany the generated output file.

PCHOLD is used to automatically send the output file to a client application when issued in an environment that supports automatic file transfers.

SAVE creates an output file with no accompanying Master File.

filename

Is the file name of the resulting output file on VM, UNIX, or NT, or the ddname on OS/390.

The tab-delimited output file is a variable-length text file containing the column headings and data values from the report request. Leading blanks are stripped from numeric fields (format codes D, F, I, or P) and trailing blanks are stripped from character fields (format code A). Corresponding columns in each record may have different lengths because of the removal of leading and trailing blanks. On VM, the filetype is TAB. On UNIX and Windows NT, the extension is .tab. **Note:** A Master File is created if the HOLD command is used to create the output file. In the accompanying Master File, the SUFFIX value is TABT.

Reference Usage Notes for Tab-Delimited Output Files

- You must be aware of the formats and lengths supported by the application for which you are creating the output file. Field lengths created by the HOLD or SAVE command are those supported as USAGE formats in a Master File. You must take into account any limits of the destination application.
- If you use field-based reformatting in the request that creates the output file, the field lengths in the output file are the lengths from the original Master File or DEFINE command.

- If the request that creates the output file retrieves missing data described with MISSING=ON in the original Master File, the output file will contain a blank if the original field was alphanumeric, or a zero if the field was numeric.
- As with all HOLD files, column headings specified with an AS phrase are ignored unless you set ASNAMES to ON. When ASNAMES is set ON, the value from the AS phrase, up to but not including the comma, becomes the field name in the HOLD Master File.
- Regardless of the ASNAMES setting, the column heading in the TABT data file is the value of the AS phrase exactly as specified in the request.
- The SAVB command is not supported.
- The TABLEF command is not supported.
- The OVER phrase is not supported.
- Text fields are not supported.
- There is a 32K record length limit in the output file
- Blank fieldnames will show up as blank column titles. This may result in an error when attempting to use the file as input to various applications.
- A double-precision number expressed in scientific notation is stored with the character D before the exponent. For example, the command PRINT RETAIL_COST/D9.3E prints the values in the following form: 0.888D+04. Some applications may not understand this value, as they generally expect an E before the exponent. Printing the value as single precision floating point instead of double precision produces a value with an E before the exponent. For example, format F9.3E produces the value 0.888E+04.

Example Creating a Tab-Delimited File

```
TABLE FILE MOVIES
PRINT COPIES TITLE WHOLESALPR AS 'WHOLESALE,PRICE'
BY CATEGORY
WHERE CATEGORY EQ 'ACTION' OR 'CHILDREN'
      ON TABLE HOLD AS TABTH FORMAT TABT
END
```

Leading blanks are removed from numeric fields and trailing blanks are removed from character fields in the TABTH output file, and the first row contains column headings. The AS phrase becomes the column heading for the WHOLESALPR field regardless of the ASNAMES setting.

The following shows the generated output file. The right arrows represent the tab characters:

```
CATEGORY → COPIES → TITLE+WHOLESALE,PRICE
ACTION → 2 → JAWS→10.99
ACTION → 3 → ROBOCOP → 11.50
ACTION → 4 → TOTAL RECALL → 11.99
ACTION → 2 → TOP GUN → 9.99
ACTION → 3 → RAMBO III → 10.99
CHILDREN → 1 → SMURFS, THE+10.00
CHILDREN → 2 → SHAGGY DOG, THE → 29.99
CHILDREN → 1 → SCOOPY-DOO-A DOG IN THE RUFF→9.75
CHILDREN → 2 → ALICE IN WONDERLAND → 12.50
CHILDREN → 1 → SESAME STREET-BEDTIME STORIES AND SONGS → 7.65
CHILDREN → 1 → ROMPER ROOM-ASK MISS MOLLY → 7.99
CHILDREN → 1 → SLEEPING BEAUTY → 15.99
CHILDREN → 3 → BAMBI+12.00
```

With ASNAMES set to OFF, the TABTH Master File is:

```
FILE=TABTH           ,SUFFIX=TABT
SEGNAME=TABTH       ,SEGTYPE=S01
FIELDNAME   =CATEGORY      ,E01           ,A8           ,A08           , $
FIELDNAME   =COPIES        ,E02           ,I3           ,A03           , $
FIELDNAME   =TITLE         ,E03           ,A39          ,A39           , $
FIELDNAME   =WHOLESALEPR   ,E04           ,F6.2         ,A06           , $
```

With ASNAMES set to ON, the TABTH Master File is:

```
FILE=TABTH           ,SUFFIX=TABT
SEGNAME=TABTH       ,SEGTYPE=S01
FIELDNAME   =CATEGORY      ,E01           ,A8           ,A08           , $
FIELDNAME   =COPIES        ,E02           ,I3           ,A03           , $
FIELDNAME   =TITLE         ,E03           ,A39          ,A39           , $
FIELDNAME   =WHOLESALE     ,E04           ,F6.2         ,A06           , $
```

NF880: Exit on Error

Using the SET ERROROUT command, you can control how a batch FOCUS job step or an EDA server responds to error conditions encountered in a procedure.

The ERROROUT setting is ignored in an interactive session. If you issue the SET ERROROUT command in an interactive setting, the following message is returned:

`SETTING IGNORED IN INTERACTIVE MODE`

Controlling Batch Error Processing

With the ON setting, the result is as follows when an error message is generated:

- In a batch FOCUS job, the return code is set to 8 and the job step terminates. The user can then test this return code in subsequent job steps.
- For EDA, the procedure terminates and the error message is returned to the client.

In addition, the following message displays to inform the user why the program terminated:

`Exiting due to Exit on Error`

Warning messages do not invoke this behavior. When a warning is generated, processing continues as normal.

With the OFF setting, no return code is set. Depending on the specific message, FOCUS determines whether FOCEXEC processing continues.

Users can check a Dialogue Manager variable such as &FOCERRNUM and issue the following command to terminate FOCUS and set *n* as the return code:

```
-QUIT FOCUS n
```

On VM, if you include the QUEUE 'FIN' command in your batch FOCUS EXEC, and if FOCUS terminates as a result of the ERROROUT setting, the queued FIN command will cause CMS to issue a return code of -3, which will overwrite the ERROROUT return code. If you want to see the return code issued by Exit on Error, you can remove the QUEUE 'FIN' command from the EXEC and include the following command immediately after the 'EXEC FOCUS' command to exit and issue the return code:

```
exit rc
```

Syntax How to Control Batch Error Processing

```
SET ERROROUT = {ON|OFF}
```

where:

ON

In response to any error in a batch FOCUS job step, sets the return code to 8 and terminates the job step. In response to an error on an EDA server, terminates the procedure and returns the error message to the client. This setting is ignored in an interactive session.

OFF

Does not set a return code or automatically terminate a job step or procedure in response to any error message. This is the default value.

Reference Usage Notes for Exit on Error

- In unique cases, Information Builders may choose to reclassify specific errors or warnings or exempt specific errors from this behavior.
- The SET ERROROUT command can be issued in any supported profile, in the batch input stream, or in a FOCEXEC. It is not supported in a TABLE request, using ON TABLE SET syntax.
- If the user code handles return codes by using a technique such as checking &FOCERRNUM having this feature enabled will cause the program to exit and, therefore, ignore the error handling logic. In this situation, the user should set ERROROUT to OFF in order to have the error handling logic respected.

Example Using Exit on Error on OS/390

Consider the following in-stream request in a batch FOCUS job:

```
//SYSIN      DD *
SET ERROROUT = ON
DYNAM ALLOC DD MYFILE DS USER1.MYFILE.DATA SHR REU
TABLE FILE NOMFD
PRINT *
ON TABLE HOLD AS MYFILE
END
FIN
/*
//COPYIT EXEC PGM=IEBCOPY,COND=(4,LT),REGION=2M
.
.
.
```

The JES log contains the following messages:

```
TABLE FILE NOMFD
(FOC205) THE DESCRIPTION CANNOT BE FOUND FOR FILE NAMED: NOMFD
BYPASSING TO END OF COMMAND
Exiting due to Exit on Error...
```

The FOCUS job step terminates in response to the FOC205 error, and the return code for the job step is set to 8.

The COPYIT job step does not execute because the return code is 8, and the parameter COND=(4,LT) means that it only executes if all preceding job steps terminate with a return code between zero and four.

Example Using Exit on Error on VM

The following EXEC executes FOCUS in batch on VM. It contains the exit rc command to return the FOCUS return code to VM. The ERROUT FOCEXEC sets ERROROUT to ON and issues a request that results in an error condition:

```
ATTACH PMSDJG 191 '(' M
'ATTACH FOCLIB'
'ATTACH F7029907 294 (F '
GLOBAL TXTLIB FUSELIB
QUEUE 'EX ERROUT1'
'EXEC FOCUS'
exit rc
```

The VM Batch status shows the return code of 8:

```
,LISXXC01                                Batch Job List                                VM:Batch
-----
Command  Jobname  Jobid   Owner   Class  -----  Status: CURRENT  -----  PREV
          JOB6296  6296    PMSDJG   A      completed; Return Code: 8                      END
```

NF849: Extended Currency Symbol Support

By default, the M and N display options print the currency symbol associated with the code page being used by your system. For example, when using the U. S. code page, the M and N options display the dollar sign (\$).

Extended currency symbol format options allow you to display the following currency symbols regardless of the code page used: U. S. dollar, euro, British pound, and Japanese yen.

The M and N options continue to operate as in prior releases.

Extended Currency Symbol Format Options

The extended currency symbol format options consist of two characters: an exclamation point followed by one of the supported upper or lower case letters. An upper case letter displays a floating currency symbol on each detail line. A lower case letter displays a fixed currency symbol to the left of the field on the first detail line of each report page. These options are valid for numeric formats (I, D, F, and P).

Syntax How To Display an Extended Currency Symbol

Use the following character combinations as the final two characters in any numeric display format:

Display Option	Description	Example
!d	Fixed dollar sign	D12.2!d
!D	Floating dollar sign	D12.2!D
!e	Fixed euro symbol	F10.2!e
!E	Floating euro symbol	F10.2!E
!l	Fixed British pound sign	D12.1!l
!L	Floating British pound sign	D12.1!L
!y	Fixed Japanese yen symbol	I9!y
!Y	Floating Japanese yen symbol	I9!Y

Reference Usage Notes for Extended Currency Symbol Support

- Format specifications are limited to a total of eight characters.
- The extended currency option must be the last option in the format.
- The extended currency option cannot be used in the same format specification as M or N.

- In order to display or print the extended currency symbols, you must be sure they are supported by the fonts accessible to your emulation software or printer.
- The symbol displayed by the M and N options is dependent on the code page being used. The !d and !D options always display a dollar sign, regardless of the code page.
- Using a fixed currency symbol places the symbol only on the first line of each report page. If you use field-based reformatting to display multiple currency symbols in one report column, only the symbol associated with the first row will display. In this case, you should use floating currency symbols.
- Lower case letters are transmitted as upper case letters by the terminal I/O procedures. Therefore, the fixed extended currency symbols can only be specified in a FOCEXEC.
- In TSO, when you display report output without HotScreen (SET SCREEN=OFF), by default the extended currency symbols do not display because the terminal I/O procedures translate all terminal output to characters that appear in USA EBCDIC keyboard layouts and code charts. You can change this default behavior with the following command:

```
SET TRANTERM = {ON|OFF}
```

where:

ON

Does not display extended currency symbols. ON is the default.

OFF

Displays extended currency symbols.

Example Displaying Extended Currency Symbols

The following request uses field-based reformatting to display the Japanese yen on the report row that represents Japan, the British pound on the row that represents England, and the euro on the row that represents Italy. Note that the comma inclusion display option (C) in the format for England is specified prior to the currency option:

```
DEFINE FILE CAR
CFORMAT/A8 = DECODE COUNTRY('ENGLAND' 'F12.1C!L' 'JAPAN' 'D12!Y'
                        ELSE 'D12.2!E');
END
```

```
TABLE FILE CAR
PRINT SALES/CFORMAT DEALER_COST/CFORMAT
BY COUNTRY
  WHERE COUNTRY EQ 'ENGLAND' OR 'JAPAN' OR 'ITALY'
  WHERE SALES GT 0
END
```

The output is:

COUNTRY	SALES	DEALER COST
-----	-----	-----
ENGLAND	£12,000.0	£11,194.0
ITALY	€30,200.00	€16,235.00
JAPAN	¥78,030	¥5,512

NF886: Reusable MSO/CICS Control Blocks

MSO provides a facility to re-use orphaned control blocks. If you time out or get disconnected, the control block that you are using goes into a pool. If you return under normal conditions you will get your old control block back, as long as it is still available.

If you try and restart your MSO connection and the MSO/CICS environment has run out of control blocks the following message is displayed:

```
FOCUS session ended: Error unknown or no longer available
```

NF898: SQL Support for Date-Time Formats

The relational data adapters and the SQL Translator now support the date-time data type introduced in FOCUS 7.1. This data type accurately describes RDBMS TIME, DATE, and TIMESTAMP columns. The AUTODB2 and AUTOSQL procedures have been updated to create Master Files that take advantage of this support. In addition, AUTODB2 now supports the DDF (Distributed Data Facility) feature, which allows three-part table names in which the first part of the name specifies a location.

Date-Time Support for the Relational Data Adapters

The date-time data type (format H) can be used to represent time, date, and timestamp data types available in many relational data sources.

In a Master File, the USAGE format for a date-time field describes which components to display and various options for displaying them. In Master Files for relational data sources, date-time fields must also have an ACTUAL format that indicates how the date-time value is stored in the data source.

ACTUAL formats supported for relational date-time values are listed in the following table. The corresponding USAGE must be an H format.

RDBMS	RDBMS DATA TYPE	ACTUAL FORMAT
DB2 and SQL/DS	TIME	HHIS
	TIMESTAMP	HY YM Dm
	DATE	DATE
Oracle	DATE	HY YM DS

Reference Using Date-Time Columns in Requests

- These data types are supported for Direct SQL Passthru, TABLE, MODIFY, Maintain, and SQL Translator requests. They are not supported for Static TABLE or MODIFY requests.
- AUTODB2, AUTOSQL, and CREATE FILE support these data types.
- Date-time manipulation handled by the FOCUS date-time functions is not converted to SQL.
- The only optimized selection criteria on date-time columns (criteria passed to the RDBMS in the generated SQL) are relational expressions that are valid in an IF clause. For example, comparison of a date-time column with a date-time literal value is optimized, but comparison of a date-time column with another date-time column is not optimized.

Example Using a Date-Time Column in a DB2 Table

The DB2 table named EMPINFO has the following columns:

- HIRE_DATE, with ACTUAL = DATE.
- HIRE_DATE_TIME, with ACTUAL = HYYMDm.
- HIRE_TIME, with ACTUAL = HHIS.

The EMPINFO Master File follows:

```
FILENAME=EMPINFO ,SUFFIX=SQLDS,$

SEGNAME=EMPINFO ,SEGTYPE=S0,$
  FIELD=EMP_ID ,ALIAS=EID ,USAGE=A9 ,ACTUAL=A9 ,,$
  FIELD=LAST_NAME ,ALIAS=LN ,USAGE=A15 ,ACTUAL=A15 ,,$
  FIELD=FIRST_NAME ,ALIAS=FN ,USAGE=A10 ,ACTUAL=A10 ,,$
  FIELD=HIRE_DATE ,ALIAS=HDT ,USAGE=YMD ,ACTUAL=DATE ,,$
  FIELD=DEPARTMENT ,ALIAS=DPT ,USAGE=A10 ,ACTUAL=A10 ,
    MISSING=ON,$
  FIELD=CURRENT_SALARY ,ALIAS=CSAL ,USAGE=P9.2 ,ACTUAL=P4 ,,$
  FIELD=CURR_JOBCODE ,ALIAS=CJC ,USAGE=A3 ,ACTUAL=A3 ,,$
  FIELD=ED_HRS ,ALIAS=OJT ,USAGE=F6.2 ,ACTUAL=F4 ,
    MISSING=ON,$
  FIELD=BONUS_PLAN ,ALIAS=BONUS_PLAN ,USAGE=I4 ,ACTUAL=I4 ,,$
  FIELD=HIRE_DATE_TIME ,ALIAS=HDTT ,USAGE=HYYYMDm ,ACTUAL=HYYYMDm ,,$
  FIELD=HIRE_TIME ,ALIAS=HT ,USAGE=HHIS ,ACTUAL=HHIS ,,$
```

The following request prints the date-time columns:

```
TABLE FILE EMPINFO
PRINT HIRE_DATE HIRE_DATE_TIME HIRE_TIME
BY LAST_NAME BY FIRST_NAME
END
```

The output is:

LAST_NAME	FIRST_NAME	HIRE_DATE	HIRE_DATE_TIME	HIRE_TIME
-----	-----	-----	-----	-----
BANNING	JOHN	82/08/01	1982/08/01 16:41:29.453858	16:41:29
BLACKWOOD	ROSEMARIE	82/04/01	1982/04/01 08:41:26.584838	08:41:26
CROSS	BARBARA	81/11/02	1981/11/02 12:30:01.398742	12:30:01
GREENSPAN	MARY	82/04/01	1982/04/01 15:30:17.194398	15:30:17
IRVING	JOAN	82/01/04	1982/01/04 15:45:04.394574	15:45:04
JONES	DIANE	82/05/01	1982/05/01 14:43:56.348577	14:43:56
MCCOY	JOHN	81/07/01	1981/07/01 09:39:46.492837	09:39:46
MCKNIGHT	ROGER	82/02/02	1982/02/02 17:36:21.685746	17:36:21
ROMANS	ANTHONY	82/07/01	1982/07/01 07:22:34.784738	07:22:34
SMITH	MARY	81/07/01	1981/07/01 07:36:25.838573	07:36:25
	RICHARD	82/01/04	1982/01/04 08:02:02.994847	08:02:02
STEVENS	ALFRED	80/06/02	1980/06/02 10:35:42.275949	10:35:42

AUTODB2 Support for DDF

AutoDB2 now supports retrieval from and Master File creation for tables from secondary locations. When a location is specified, the TABLENAME attribute in the Access File consists of three parts: *location.creator.tablename*.

During installation, a list of valid locations is included in the AUTODB2 utility. The list appears on the main menu, just below the row in which the user can enter the location. The first value in the list appears by default in the main menu. The user can enter any one the values in the list. Entering a value not on the list generates the following error message:

```
PLEASE ENTER A VALID LOCATION.
```

Table, column, and index information is retrieved from the selected location's catalog tables. The location is included in a three-part table name in the Access File if it is not blank.

Note: The menu option 'Use Creator Name in AFD?=N' is ignored when a non-blank location is provided. That is, the creator is included in the three-part table name even when you specify to not include it on the main menu.

The value for location that you include on the menu is logged to the parameter log file when you press PF4 to log parameters. The next session of AutoDB2/SQL will display the logged value.

Procedure How to Install AUTODB2 DDF Support

Create a list of valid locations by editing the following lines in the AUTODB2 FOCEXEC. Uncomment the -DEFAULT command and enter up to six location names. The start and end of the list must be enclosed in single quotation marks, and each name must be eight characters long, padded on the right with blanks if necessary:

```
-
*=====
-* Change &LOC_LIST to contain possible location values, padded to 8
-* characters, separated by commas. The entire string is enclosed in
-* single quotes. Include a maximum of 6 locations. The first entry is
-* the default. Example:
-* -DEFAULT &LOC_LIST='PROD      ,TEST      ,DEVELOPM'
-*          <----->,<----->,<----->,<----->,<----->,<----->
-DEFAULT &LOC_LIST='          ,          ,          ,          ,          ,          '
```

A blank location name designates the location where the plan was bound.

Example Creating a Location List

With the following list, blank will be the default value that appears on the main menu.

```
-DEFAULT &LOC_LIST='          ,LOCDSNA ,LOCDSNC '
```


Note: Specifying blank (' ') as the first option indicates that the default is the location where the plan was bound.

AUTODB2/SQL Support for TIME and TIMESTAMP

AUTODB2/SQL now supports native RDBMS TIMESTAMP and TIME formats. You can provide any legal format on the main menu for TIMESTAMP and TIME column types. All TIMESTAMP and TIME columns will be described with the format you provide. The default USAGE format for TIMESTAMP is HYYMDm and the default format for TIME is HHIS. Values are verified, and invalid entries generate an error. To provide backward compatibility, the previously used values of A26 (TIMESTAMP) and A8 (TIME) can still be entered.

Note: These formats are case sensitive. You must type in the values on the AUTODB2/SQL menu in the proper case. The values for TIMESTMP and TIME formats that you include on the menu are logged to the parameter log file when you press PF4 to log parameters. The next session of AUTODB2/SQL will display the logged values.

AUTODB2/SQL Screens That Support DDF and Date-Time Formats

The AUTODB2/SQL main menu now includes entries for the location parameter and for TIME and TIMESTAMP formats. (For detailed instructions on entering information on these screens, see the *DB2 and SQL/DS Read/Write Interface User's Manual*.)

The default values display initially. However, you can change these defaults by entering your preferences and logging them to the parameter log file by pressing PF4:

```
Main Menu      Master File Generation Facility for DB2
Master Filename =====> timestmp

Location => locdsna      Creator => USER1      Table => TIMESTMP
Location values:          ,LOCDSNA ,LOCDSNC
Database Name =====> *
Description will be a member of:
Master Target PDS => PMSLCC.MASTER.DATA
Access Target PDS => PMSLCC.FOCSQL.DATA
FOCDEF Target PDS => PMSLCC.FOCDEF.DATA
Replace Existing Description?=> Y          (Y/N)
Read/Write Functionality =====> W          (R=Read,W=Write)
Date Display Format =====> YYMD
Time Stamp Display Format =====> HHYMDm
Time Display Format =====> HHIS
Display Decimal when SCALE=0?=> Y          (Y/N)
Use LABEL as Column Heading? => N          (Y/N)
Use Remarks for FOCDEF? =====> N          (Y/N)
Use Creator Name in AFD? =====> Y          (Y/N)
Use Long Fieldnames? =====> Y          (Y/N)
Parm File => PMSLCC.FOCSQL.DATA

PF1=Help PF2=Restart PF3=Exit PF4=Log PF5=MFD PF6=AFD PF9=Picture PF10=List
```

The table selection screen now also displays the location parameters for the list of tables generated by your selections on the main menu:

```
Master:      Master File Generation Facility for DB2
TIMSTMP      ==Table Selection==
```

Place an 'R' next to the Table to be the root of the Master.
Place a 'C' next to all other Tables to be described as children.
Enter 'Y' next to all selected Tables that will be updated.

Location	Creator Name	DB2 Table Name	Select (R/C)	Write (Y/N)
-----	-----	-----	-----	-----
LOCDSNA	PMSLCC	TIMSTMP	r	Y

PF1=Help PF3=End PF4=Add Tables PF7=Up PF8=Down

When the Master and Access Files are generated, you return to the main menu with the DESCRIPTION CREATED message at the bottom:

```
Main Menu      Master File Generation Facility for DB2
Master Filename =====> TIMSTMP

Location => LOCDSNA   Creator => PMSLCC   Table => TIMESTMP
Location values:      ,LOCDSNA ,LOCDSNC
Database Name =====> *
Description will be a member of:
Master Target PDS => PMSLCC.MASTER.DATA
Access Target PDS => PMSLCC.FOCSQL.DATA
FOCDEF Target PDS => PMSLCC.FOCDEF.DATA
Replace Existing Description?=> Y          (Y/N)
Read/Write Functionality =====> W          (R=Read,W=Write)
Date Display Format =====> YYMD
Time Stamp Display Format =====> HYYMDm
Time Display Format =====> HHIS
Display Decimal when SCALE=0?=> Y          (Y/N)
Use LABEL as Column Heading? => N          (Y/N)
Use Remarks for FOCDEF? =====> N          (Y/N)
Use Creator Name in AFD? =====> Y          (Y/N)
Use Long Fieldnames? =====> Y          (Y/N)
Parm File => PMSLCC.FOCSQL.DATA
```

DESCRIPTION CREATED

PF1=Help PF2=Restart PF3=Exit PF4=Log PF5=MFD PF6=AFD PF9=Picture PF10=List

At this point, you can press PF5 to open the Master File or PF6 to open the Access File in TED.

The generated Master File follows:

```
$$$ CREATED BY AUTODB2 ON 11/14/01 AT 12.46.37 BY USER1
FILENAME=TIMSTMP,SUFFIX=SQLDS,$

SEGNAME='TIMSTMP',SEGTYPE=S0,$
FIELD=ALPHA8,ALPHA8,A8,A8,MISSING=ON,$
FIELD=DATE1,DATE1,YYMD,DATE,MISSING=ON,$
FIELD=TIME1,TIME1,HHIS,HHIS,MISSING=ON,$
FIELD=TIMESTMP,TIMESTMP,HYYMDm,HYYMDm,MISSING=ON,$
```

The generated Access File follows:

```
$$$ CREATED BY AUTODB2 ON 11/14/01 AT 12.46.37 BY USER1
$$$ FILENAME=TIMSTMP,SUFFIX=SQLDS,$

SEGNAME='TIMESTMP',TABLENAME=' "LOCDSNA"."USER1"."TIMESTMP"',
KEYS=00,WRITE=YES,KEYORDER=LOW,$
```

Executing AUTODB2 in Batch

To execute AUTODB2 in batch and take advantage of DDF and TIMESTMP support, pass values to the FOCEXEC using the following syntax:

```
EX AUTODB2 BATCH=Y,MASTER=master,CREATOR=creator,TABLENAME=table
[,option1=value1 ...]
```

where:

master

Is the 1- to 8-character name of the Master File that will be generated.

creator

Is the 1- to 8-character name of the table's creator.

table

Is the 1- to 18-character name of the RDBMS table.

option1 ...

Is an option listed in the following chart.

value1 ...

Is an acceptable value for the corresponding option.

The following options are available:

Option Name	Values	Description	Default
LOC	location	Location value	First value in the location list
REPLACE	Y=Yes , N=No	Replace existing description	N
FUNC	R=Read , W=Write	Read/Write Functionality	W
DATEDISP	format	Date Display Format	YYMD
TIMESTMP	format	Time Stamp Display Format	HYYMDm
TIME	format	Time Display Format	HHIS
DECIMAL	Y=Yes , N=No	Display Decimal when SCALE=0?	Y
LABELS	Y=Yes , N=No	Use Labels as Column Heading?	N

Option Name	Values	Description	Default
REMARKS	Y=Yes , N=No	Use Remarks for FOCDEF?	N
CREATAFD	Y=Yes , N=No	Use Creator Name in AFD?	Y
LONG	Y=Yes , N=No	Use Long Filednames?	Y
USERID	<i>userid</i>	High level qualifier of output data sets (required if target data set names not provided - MVS only)	
MFDLIST	Y=Yes , N=No	Store list of Master Files created per session	N
MASTERDATA	<i>dsn</i>	Master Target PDS (MVS only)	<i>&USERID.MASTER.DATA</i>
FOCSQLDATA	<i>dsn</i>	Access Target PDS (MVS only)	<i>&USERID.FOCSQL.DATA</i>
FOCDEFDATA	<i>dsn</i>	FOCDEF Target PDS (MVS only)	<i>&USERID.FOCDEF.DATA</i>

Note the addition of LOC=, TIMESTMP=, and TIME= to this list. The default for LOC is the first value in LOC_LIST (provided at installation time). If you want a value of blank, use blank as the first value in LOC_LIST or execute AUTODB2 with the following syntax:

```
EX AUTODB2 LOC=' ' .
```

Reference Usage Notes for AUTODB2/SQL

- AUTODB2/SQL is a FOCEXEC that has a corresponding Master File. The FOCEXEC and Master File must be from the same release of FOCUS. If you attempt to use the old version of the Master File with the new version of the FOCEXEC, the following message is generated:

```
PROGRAM AND FILE DESCRIPTION DATES DO NOT MATCH: AUTODB2 date  
UNABLE TO EXECUTE AUTODB2 - PLEASE REINSTALL
```

FOCEXEC execution is terminated, and you return to the FOCUS prompt.

- As of FOCUS 7.0.9, AUTODB2 no longer needs the DB2CAT Master and Access Files and AUTOSQL no longer needs the SYSCOL Master File or INDEXES Access File. These Master and Access Files remain on the distribution tape. They are copied as part of the installation on VM; MVS instructions tell you to copy them also. However, Information Builders no longer certifies the accuracy of these Master and Access Files with future RDBMS catalog table changes.

Reference AUTODB2/SQL Error Messages

Not using the appropriate AUTODB2/SQL Master File generates the following message:

```
PROGRAM AND FILE DESCRIPTION DATES DO NOT MATCH: AUTODB2 date  
UNABLE TO EXECUTE AUTODB2 - PLEASE REINSTALL
```

supplying an invalid location value generates the following message:

```
PLEASE ENTER A VALID LOCATION
```

Supplying an invalid USAGE format for TIMESTAMP generates the following message:

```
INVALID TIME STAMP DISPLAY FORMAT
```

Supplying an invalid USAGE format for TIME generates the following message:

```
INVALID TIME DISPLAY FORMAT
```

SQL Translator Support for Date-Time Fields

Several new data types have been defined to the SQL Translator to support date-time fields in the WHERE predicate or field list of a SELECT statement. In the following discussion, fff represents the second to three decimal places (milliseconds) and fffff represents the second to six decimal places (microseconds).

The following formats are allowed as input to the Translator:

Format	USAGE	Components
Date	YYMD	YYYY-MM-DD
Hour	HH	HH
Hour through minute	HHI	HH.MM
Hour through second	HHIS	HH.MM.SS
Hour through millisecond	HHISs	HH.MM.SS.fff
Hour through microsecond	HHISsm	HH.MM.SS.ffffff
Year through hour	HYMDH	YYYY-MM-DD-HH
Year through minute	HYMDI	YYYY-MM-DD-HH.MM
Year through second	HYMDS	YYYY-MM-DD HH.MM.SS
Year through millisecond	HYMDs	YYYY-MM-DD-HH.MM.SS.fff
Year through microsecond	HYMDm	YYYY-MM-DD-HH.MM.SS.ffffff

Notice that:

- Time information may be given to the hour, minute, second, millisecond, or microsecond.
- The Translator automatically converts date-time literals to the format required by the RDBMS. Therefore, when you specify a date-time literal, you can use a hyphen or slash between the date components, a colon or period between the time components, and a hyphen or space to separate the date from the time.

Operations on Date-Time Data Supported by the SQL Translator

Time or timestamp columns can be defined in relational data sources, and date-time fields can be defined in FOCUS data sources. These are accessible to the translator. Values can be entered using INSERT and UPDATE statements and displayed in SELECT statements.

Time or timestamp data items (columns or literals) can be compared in conditions. Time values or timestamp values can be added or subtracted from each other, with the result being the number of seconds difference. Expressions of the form T + 2 DAYS or TS + 5 YEARS are allowed. These expressions will be translated to calls to the FOCUS date-time functions.

Extracting Date-Time Components Using the SQL Translator

The SQL Translator supports several functions that return components from date-time values. You can also use the EXTRACT statement to extract components.

Syntax Date-Time Functions Accepted by the Translator

The following functions return date-time components as integer values.

Assume x is a date-time value:

Function	Return value
<code>YEAR(x)</code>	year
<code>MONTH(x)</code>	month number
<code>DAY(x)</code>	day number
<code>HOUR(x)</code>	hour
<code>MINUTE(x)</code>	minute
<code>SECOND(x)</code>	second
<code>MILLISECOND(x)</code>	millisecond
<code>MICROSECOND(x)</code>	microsecond

Example Using SQL Translator Date-Time Functions

Using the timestamp column TS whose value is '1999-11-23 07:32:16.123456':

```
YEAR(TS) = 1999
MONTH(TS) = 11
DAY(TS) = 23
HOUR(TS) = 7
MINUTE(TS) = 32
SECOND(TS) = 16
MILLISECOND(TS) = 123
MICROSECOND(TS) = 123456
```

Example Using SQL Translator Date-Time Functions in a SELECT Statement

Using the DB2 table EMPINFO, consider the following SQL Translator request that prints the field HIRE_DATE_TIME, the year value, month value, minute value, and second value:

```
SQL
SELECT HIRE_DATE_TIME,
YEAR(HIRE_DATE_TIME), MONTH(HIRE_DATE_TIME),
MINUTE(HIRE_DATE_TIME), SECOND(HIRE_DATE_TIME)
FROM EMPINFO;
ECHO ON
END
```

The Translator produces the following Direct SQL Passthru request:

```
SQL SQLDS
SELECT SQLCOR01.HD TT , YEAR (SQLCOR01.HD TT ), MONTH (SQLCOR01.HD TT ),
MINUTE (SQLCOR01.HD TT ), SECOND (SQLCOR01.HD TT ) FROM USER1."EMPINFO"
SQLCOR01
FOR FETCH ONLY;
END
```

The following report output is generated:

HD TT	E02	E03	E04	E05
----	---	---	---	---
1980-06-02-10.35.42.275949	1980	6	35	42
1981-07-01-07.36.25.838573	1981	7	36	25
1982-05-01-14.43.56.348577	1982	5	43	56
1982-01-04-08.02.02.994847	1982	1	2	2
1982-08-01-16.41.29.453858	1982	8	41	29
1982-01-04-15.45.04.394574	1982	1	45	4
1982-07-01-07.22.34.784738	1982	7	22	34
1981-07-01-09.39.46.492837	1981	7	39	46
1982-04-01-08.41.26.584838	1982	4	41	26
1982-02-02-17.36.21.685746	1982	2	36	21
1982-04-01-15.30.17.194398	1982	4	30	17
1981-11-02-12.30.01.398742	1981	11	30	1

Assume a FOCUS data source called EMPDT has the same fields and formats as the EMPINFO table. Running the same SQL Translator request against the FOCUS data source produces the following FOCUS request:

```
DEFINE FILE EMPDT
SQLDEF01/I5 = HPART(HIRE_DATE_TIME, 'YEAR', 'I5');
SQLDEF02/I5 = INT(SQLDEF01);
SQLDEF03/I3 = HPART(HIRE_DATE_TIME, 'MONTH', 'I3');
SQLDEF04/I3 = INT(SQLDEF03);
SQLDEF05/I3 = HPART(HIRE_DATE_TIME, 'MINUTE', 'I3');
SQLDEF06/I3 = HPART(HIRE_DATE_TIME, 'SECOND', 'I3');
END
TABLEF FILE EMPDT
PRINT HIRE_DATE_TIME SQLDEF02 SQLDEF04 SQLDEF05 SQLDEF06
ON TABLE SET CARTESIAN ON
ON TABLE SET ASNAMES ON
ON TABLE SET HOLDLIST PRINTONLY
END
```

The report output is the same as that produced using the EMPINFO table. Note that the SQL Translator functions were converted to DB2 functions in the request against the DB2 table and were converted to calls to the date-time functions when run against the FOCUS data source.

Syntax Using the SQL Translator EXTRACT Function to Extract Date-Time Components

You can use the following ANSI standard function to extract date-time components as integer values:

```
EXTRACT(component FROM value)
```

where:

component

Is one of the following: YEAR, MONTH, DAY, HOUR, MINUTE, SECOND, MILLISECOND, or MICROSECOND.

value

Is a date-time, DATE, TIME, or TIMESTAMP field, constant or expression.

For example, the following are equivalent:

```
EXTRACT(YEAR FROM TS)
YEAR(TS)
```

Example Using the EXTRACT Function

```
SELECT TS, EXTRACT(YEAR FROM TS), EXTRACT(MONTH FROM TS),
EXTRACT(DAY FROM TS) FROM TBL1
```

This request produces rows similar to the following:

1999-01-01	1999	1	1
2000-03-03	2000	3	3

NF914: LMF Site Code Warning Message

Each site is required to register its site code as part of the FOCUS installation process. If this installation step is not completed, users will see the following warning message every time they enter FOCUS:

```
*****  
* VIOLATION: *  
* THE SITE CODE FOR YOUR COMPANY WAS NOT REGISTERED *  
* PROPERLY DURING THE FOCUS INSTALLATION PROCESS. *  
* PLEASE CONTACT IBI. "EX READMEF" FOR COMPLETE DETAILS *  
*****
```

Note that all LMF (License Management Facility) site code messages are warning messages.

7.1 New Features

General Enhancements

NF696: Calling Subroutines Written in REXX

NF750: DATASET in a Master File

NF751: Date-Time Data Type

NF773: Token Delimited Files

NF778: Dialogue Manager TRUNCATE Function

NF779: FOCUS CRTFORM HTML Translation

Reporting Enhancements

NF692: Aggregating and Sorting Report Columns

NF731: Reporting From Independent Paths

NF749: HOLD FORMAT INTERNAL

NF755: Using FILEDEF for Creating Extract Files

NF761: Comma Suppress Edit Format Option

NF762: Percent Edit Format Option

NF766: DEFINE Functions

NF781: Embedding Text Fields in Headings

Raised Limits

NF777: Two-Gigabyte FOCUS Database Support

NF759: Increased Number of Display Fields

Performance Enhancements

NF777: Partitioned FOCUS Data Sources

Oracle Data Adapter

NF782: Oracle Data Adapter IXSPACE Setting

Adabas Data Adapter

NF785: The Adabas Write Data Adapter for FOCUS

NF692: Aggregating and Sorting Report Columns

Aggregation and sorting may be applied simultaneously to numeric columns in your report in one pass of the data.

Syntax How To Sort by a Report Column

The syntax is:

```
BY [HIGHEST|LOWEST {n} ] TOTAL display field
```

where:

n

Is the number of instances you wish to extract from the data source.

display field

Can be a fieldname, prefixoperator.fieldname or calculated value.

Example Sorting by a Report Column

A BY TOTAL field is treated as a display field when the matrix is created. After the matrix is created, the output lines are aggregated and re-sorted based on all of the sort fields. Then the output is produced. For example,

NF692: Aggregating and Sorting Report Columns

```
TABLE FILE MOVIES
SUM LISTPR
BY CATEGORY
BY RATING
BY HIGHEST 5 TOTAL AVE.WHOLESALEPR AS 'AVE,WHOLESALEPR'
PRINT WHOLESALEPR
BY CATEGORY
BY RATING
WHERE CATEGORY EQ 'CLASSIC' OR 'MYSTERY'
END
```

The output is:

CATEGORY	RATING	AVE WHOLESALEPR	LISTPR	WHOLESALEPR
-----	-----	-----	-----	-----
CLASSIC	G	40.99	89.95	40.99
	NR	16.08	314.76	14.99
				20.00
				15.99
				10.95
				10.95
				9.99
				40.99
				10.95
				10.99
MYSTERY	NR	9.00	19.98	15.00
				9.00
	PG	9.00	39.96	9.00
				9.00
				9.00
	PG13	9.00	19.98	9.00
	R	16.19	155.89	15.99

Reference Requirements

You must have an aggregating display command (SUM) for BY TOTAL to work correctly. A non-aggregating display command (PRINT) simply retrieves the data without aggregating it. The records will be sorted in either ascending or descending sequence based on your query.

NF696: Calling Subroutines Written in REXX

A FOCUS request can now call user-written subroutines coded in REXX. These routines, also called FUSREXX macros, add a 4GL option to the languages supported for user-written subroutines.

Using REXX Subroutines

REXX subroutines are supported in the VM/CMS and MVS environments:

- In CMS, a FUSREXX macro can contain either REXX source code or compiled REXX code created by running the source code through the REXX compiler. In addition, you can load either type of FUSREXX macro into memory using the EXECLOAD command. The compilation and load process reduces the CPU requirements and increases speed. Compilation also is a security tool, making private information difficult to read.
- In MVS, FOCUS supports source versions of REXX subroutines only.

Because of CPU requirements, the use of FUSREXX routines in large production jobs should be monitored carefully.

The following notes apply to the examples in this document:

- REXX versions are not necessarily the same in all operating environments. Therefore, some of the examples may use REXX functions that are not available in your environment.
- The REXX code is listed, but not fully explained. See your REXX documentation for information about REXX instructions and functions.

Syntax How to Call a REXX User-Written Subroutine

In a DEFINE FILE command:

```
DEFINE FILE filename  
fieldname/{An|In} = subname(inlen1, inparm1, ..., outlen, outparm);  
END
```

In a DEFINE attribute in the Master File:

```
DEFINE fieldname/{An|In} = subname(inlen1, inparm1, ..., outlen,  
outparm);
```

In a COMPUTE command:

```
fieldname/{An|In} = subname(inlen1, inparm1, ..., outlen, outparm);
```

In a Dialogue Manager -SET command:

```
-SET &var = subname(inlen1, inparm1, ..., outlen, outparm);
```

where:

fieldname

Is the name of the field to receive the return value.

An|In

Is the format of the field to receive return value.

subname

Is the name of the REXX routine.

inlen1, inparm1 ...

Are the input parameters. Each parameter consists of a pair of values: a length and an alphanumeric parameter value. You can supply the name of an alphanumeric field, an alphanumeric literal, or an expression that resolves to an alphanumeric value. Up to 13 input parameter pairs are supported by FOCUS. Each parameter value can be up to 256 bytes long.

Note: Dialogue Manager converts input parameters that consist of numeric digits to decimal format, regardless of their original data type. Therefore, you cannot pass numeric input parameters to a REXX routine using -SET.

outlen, outparm

Is the output parameter pair, consisting of a length and a return value. In most cases, the return value should be alphanumeric, but integer return values are also supported. The return value can be the name of the field or Dialogue Manager variable to which the value is returned or its USAGE format enclosed in single quotation marks. The return value can be a minimum of one byte long and a maximum (for an alphanumeric value) of 256 bytes. **Note:** If the value returned is integer, *outlen* must be 4 because FOCUS reserves four bytes for integer fields.

&var

Is the name of the Dialogue Manager variable to receive the return value.

REXX subroutines:

- Require input data to be character and should return character output. Integer return values are also supported, but the output length in the subroutine call must be four. FOCUS has a 256-byte limit on character variables. This limit also applies to FUSREXX routines. FUSREXX routines return variable length data. For this reason, you must supply the length of the input arguments and the maximum length of the output data.

- Do *not* require any input parameters, but *do* require one return parameter, which *must* return at least one byte of data. It is possible for a FUSREXX function to need no input, such as a function that returns USERID.
- Do not support floating-point numbers (REXX does not have native floating-point conversion routines). All numeric fields should be converted to character format with no commas using a FOCUS function such as EDIT before being passed to the FUSREXX routine. This prevents FOCUS from converting numbers to floating point before passing them to the FUSREXX routine.
- Are not supported in Dialogue Manager -CMS RUN commands.
- On VM/CMS, the FILETYPE of REXX user-written functions is FUSREXX; they can be stored on any accessed disk.
- On MVS, DDNAME FUSREXX must be allocated to a PDS, and that library will be searched before other MVS libraries.
- The search order for subroutines is:
 1. FUSREXX
 2. Standard CMS or MVS search order.

Example Returning the Day of the Week

The FUSREXX routine DOW returns the day of the week an employee was hired. The routine passes one input parameter pair and one return field pair.

```
DEFINE FILE EMPLOYEE
1. AHDT/A6 = EDIT(HIRE_DATE) ;
2. DAY_OF_WEEK/A9 WITH AHDT= DOW(6,AHDT,9,DAY_OF_WEEK) ;
END
```

```
TABLE FILE EMPLOYEE
PRINT LAST_NAME HIRE_DATE DAY_OF_WEEK
END
```

1. The input field is six bytes long. Data is passed in field AHDT. The hire date is converted to an alphanumeric field.
2. The return field is up to nine bytes long and is named DAY_OF_WEEK.

The output is:

LAST_NAME	HIRE_DATE	DAY_OF_WEEK
-----	-----	-----
STEVENS	80/06/02	Monday
SMITH	81/07/01	Wednesday
JONES	82/05/01	Saturday
SMITH	82/01/04	Monday
BANNING	82/08/01	Sunday
IRVING	82/01/04	Monday
ROMANS	82/07/01	Thursday
MCCOY	81/07/01	Wednesday
BLACKWOOD	82/04/01	Thursday
MCKNIGHT	82/02/02	Tuesday
GREENSPAN	82/04/01	Thursday
CROSS	81/11/02	Monday

The FUSREXX macro is displayed below. The FUSREXX routine reads the input date, reformats it to MM/DD/YY format, and returns the day of the week using a REXX DATE call.

```
/* DOW routine. Return WEEKDAY from YYMMDD format date */
Arg ymd .
Return Date('W',Translate('34/56/12',ymd,'123456'),'U')
```

Example Returning Text Format

The REXX function called in this request returns the number of copies of each classic movie in text format. It passes one input parameter and one return field.

```
TABLE FILE MOVIES
PRINT TITLE AND COMPUTE
1. ACOPIES/A3 = EDIT(COPIES); AS 'COPIES'
   AND COMPUTE
2. TXTCOPIES/A8 = NUMCNT(3,ACOPIES,8,TXTCOPIES);
   WHERE CATEGORY EQ 'CLASSIC'
END
```

1. The input field is 3 bytes long. Data is passed in field ACOPIES. The COPIES field is converted to an alphanumeric field.
2. The return field is up to 8 bytes long and is named TXTCOPIES.

The output is:

TITLE	COPIES	TXTCOPIES
-----	-----	-----
EAST OF EDEN	001	One
CITIZEN KANE	003	Three
CYRANO DE BERGERAC	001	One
MARTY	001	One
MALTESE FALCON, THE	002	Two
GONE WITH THE WIND	003	Three
ON THE WATERFRONT	002	Two
MUTINY ON THE BOUNTY	002	Two
PHILADELPHIA STORY, THE	002	Two
CAT ON A HOT TIN ROOF	002	Two
CASABLANCA	002	Two

The FUSREXX macro is:

```
/* NUMCNT routine. Pass a number from 0 to 10, return a character value */
Arg numbr .
data = 'Zero One Two Three Four Five Six Seven Eight Nine Ten'
numbr = numbr + 1          /* so 0 equals 1 element in array */
Return Word(data,numbr)
```

Example Passing Multiple Arguments

The following example shows how to pass multiple arguments to a FUSREXX routine. It is an interest calculation using the present salary for the employee and the employee start date to calculate a present value. It passes four input parameters and one return field.

```
DEFINE FILE EMPLOYEE
1. AHDT/A6      = EDIT(HIRE_DATE) ;
2. ACSAL/A12    = EDIT(CURR_SAL) ;
3. DCSAL/D12.2  = CURR_SAL ;
4. PV/A12      = INTEREST(6,AHDT,6,'&YMD',3,'6.5',12,ACSA1,12,PV) ;
END
```

```
TABLE FILE EMPLOYEE
PRINT LAST_NAME FIRST_NAME HIRE_DATE DCSAL PV
END
```

1. The first input field is six bytes long. Data is passed in field AHDT. The hire date is converted to an alphanumeric field.
2. The current salary is converted to an alphanumeric field for use in the interest calculation.
3. The current salary is converted to a double-precision field to include commas and a decimal point in the output.

4. The second input field is six bytes long. Data is passed as a FOCUS character variable &YMD in YYMMDD format.

The third input field is a character value of 6.5, which is 3 bytes long to account for the decimal point in the character string.

The fourth input field is 12 bytes long. This passes the character field ACSAL.

The return field is up to 12 bytes long and is named PV.

The output is:

LAST_NAME	FIRST_NAME	HIRE_DATE	DCSAL	PV
-----	-----	-----	-----	--
STEVENS	ALFRED	80/06/02	11,000.00	14055.14
SMITH	MARY	81/07/01	13,200.00	15939.99
JONES	DIANE	82/05/01	18,480.00	21315.54
SMITH	RICHARD	82/01/04	9,500.00	11155.60
BANNING	JOHN	82/08/01	29,700.00	33770.53
IRVING	JOAN	82/01/04	26,862.00	31543.35
ROMANS	ANTHONY	82/07/01	21,120.00	24131.19
MCCOY	JOHN	81/07/01	18,480.00	22315.99
BLACKWOOD	ROSEMARIE	82/04/01	21,780.00	25238.25
MCKNIGHT	ROGER	82/02/02	16,100.00	18822.66
GREENSPAN	MARY	82/04/01	9,000.00	10429.03
CROSS	BARBARA	81/11/02	27,062.00	32081.82

The FUSREXX macro is displayed below. The REXX format command is used to format the return value.

```
/* Simple INTEREST program. dates are yymmdd format */
Arg start_date,now_date,percent,open_balance, .
begin = Date('B',Translate('34/56/12',start_date,'123456'),'U')
stop   = Date('B',Translate('34/56/12',now_date,'123456'),'U')
valnow = open_balance * (((stop - begin) * (percent / 100)) / 365)
Return Format(valnow,9,2)
```

Example Accepting Multiple Tokens in Parameters

FUSREXX routines can accept multiple tokens in a parameter. The following procedure passes employee information (pay date and monthly gross pay) as separate tokens in the first parameter. It passes three input parameters and one return field.

```
DEFINE FILE EMPLOYEE
1.  COMPID/A256 = FN | ' ' | LN | ' ' | DPT | ' ' | EID ;
2.  APD/A6 = EDIT(PAY_DATE) ;
3.  APAY/A12 = EDIT(MO_PAY) ;
4.  OK4RAISE/A1 = OK4RAISE(256,COMPID,6,APD,12,APAY,1,OK4RAISE) ;
END

TABLE FILE EMPLOYEE
PRINT EMP_ID FIRST_NAME LAST_NAME DEPARTMENT
IF OK4RAISE EQ '1'
END
```

1. The first input field is 256 bytes long. Data is passed in field COMPID. COMPID is the concatenation of several character fields passed as the first parameter. Each of the other parameters is a single argument.
2. The second input field is six bytes long. Data is passed in field APD. The pay date is converted to an alphanumeric field.
3. The third input field is 12 bytes long. Data is passed in field APAY. The monthly gross pay is converted to an alphanumeric field.
4. The return field is up to one byte long and is named OK4RAISE.

The output is:

EMP_ID	FIRST_NAME	LAST_NAME	DEPARTMENT
-----	-----	-----	-----
071382660	ALFRED	STEVENS	PRODUCTION

The FUSREXX macro is displayed below. Commas separate FUSREXX parameters. The ARG command specifies multiple variable names before the first comma and, therefore, separates the first FUSREXX parameter into separate REXX variables, using blanks as delimiters between the variables.

```
/* OK4RAISE routine. Parse separate tokens in 1st parm, then more parms*/
Arg fname lname dept empid, pay_date, gross_pay, .
If dept = 'PRODUCTION' & pay_date < '820000'
Then retvalue = '1'
Else retvalue = '0'
Return retvalue
```

FUSREXX routines *should* use the REXX RETURN function to return data to FOCUS. REXX EXIT is acceptable, but is generally used to end an EXEC, not a FUNCTION.

```
Correct
/* Some FUSREXX function */
Arg input
some rexx process ...
Return data_to_Focus
```

```
Not as Clear
/* Another FUSREXX function */
Arg input
some rexx process ...
Exit 0
```

Example Returning an Integer Value

It is possible for REXX to return a value that is *not* character format. The following example shows how REXX returns an integer value. This example also shows how the format of the integer field is used as the last field in the return argument. It passes two input fields and one return field. The FUSREXX routine NUMDAYS returns the number of days between hire date and date of increase. Note that the return value for an integer is *always* four bytes long.


```
DEFINE FILE EMPLOYEE
1. AHDT/A6 = EDIT(HIRE_DATE) ;
2. ADI/A6 = EDIT(DAT_INC) ;
3. BETWEEN/I6 = NUMDAYS(6,AHDT,6,ADI,4,'I6') ;
END
```

```
TABLE FILE EMPLOYEE
PRINT LAST_NAME HIRE_DATE DAT_INC BETWEEN
IF BETWEEN NE 0
END
```

1. The first input field is six bytes long. Data is passed in field AHDT. The hire date is converted to an alphanumeric field.
2. The second input field is six bytes long. Data is passed in field ADI. The date of increase is converted to an alphanumeric field.
3. The return field is up to six bytes long and is named BETWEEN.

The output is:

LAST_NAME	HIRE_DATE	DAT_INC	BETWEEN
-----	-----	-----	-----
STEVENS	80/06/02	82/01/01	578
STEVENS	80/06/02	81/01/01	213
SMITH	81/07/01	82/01/01	184
JONES	82/05/01	82/06/01	31
SMITH	82/01/04	82/05/14	130
IRVING	82/01/04	82/05/14	130
MCCOY	81/07/01	82/01/01	184
MCKNIGHT	82/02/02	82/05/14	101
GREENSPAN	82/04/01	82/06/11	71
CROSS	81/11/02	82/04/09	158

The FUSREXX macro is displayed below. The return value is converted from REXX character to HEX and formatted to be four bytes long.

```
/* NUMDAYS. Return number of days between 2 dates in yymmdd format */
/* The value returned will be in hex format
*/
Arg first,second .
base1 = Date('B',Translate('34/56/12',first,'123456'),'U')
base2 = Date('B',Translate('34/56/12',second,'123456'),'U')
Return D2C(base2 - base1,4)
```

Example Returning a Date Field From a FUSREXX Macro

FOCUS smart date fields contain the integer number of days since the base date 12/31/1900. REXX has a date function that can accept and return several types of date formats, including one called Base format ('B') that contains the number of days since the REXX base date 01/01/0001 (Jan. 1 of the Year 1).

Because input arguments must be alphanumeric, you cannot pass a smart date field to a REXX subroutine. Therefore, you can either:

- Pass the REXX routine an alphanumeric field with date display options and have it return a smart date value, if you account for the number of days difference between the FOCUS base date and the REXX base date and convert the result to integer.
- Pass the REXX routine a smart date value converted to alphanumeric format. With this technique, you must account for the difference in base dates for both the input and output.

The following example uses the technique of passing the subroutine an alphanumeric field with date display options. The FUSREXX macro called DATEREX1 takes two input arguments: an alphanumeric date in A8YYMD format and a number of days in character format. It returns a smart date in YYMD format that represents the input date plus the number of days. The FOCUS format A8YYMD corresponds to the REXX Standard format ('S').

The number 693959 represents the number of days difference between the FOCUS base date and the REXX base date:

```
/* REXX DATEREX1 routine. Add indate (format A8YYMD) to days */
Arg indate, days .
Return D2C(Date('B',indate,'S')+ days - 693959, 4)
```

The following request uses the DATEREX1 macro to calculate the date that is 365 days from the hire date of each employee. The input arguments are the hire date and the number of days to add. Because HIRE_DATE is in I6YMD format, it must be converted to A8YYMD before being passed to the macro:

```
TABLE FILE EMPLOYEE
PRINT LAST_NAME FIRST_NAME HIRE_DATE
AND COMPUTE
    ADATE/YYMD = HIRE_DATE; NOPRINT
AND COMPUTE
    INDATE/A8YYMD= ADATE; NOPRINT
AND COMPUTE
    NEXT_DATE/YYMD = DATEREX1(8,INDATE,3,'365',4,NEXT_DATE);
BY LAST_NAME NOPRINT
END
```

The output is:

LAST_NAME	FIRST_NAME	HIRE_DATE	NEXT_DATE
-----	-----	-----	-----
BANNING	JOHN	82/08/01	1983/08/01
BLACKWOOD	ROSEMARIE	82/04/01	1983/04/01
CROSS	BARBARA	81/11/02	1982/11/02
GREENSPAN	MARY	82/04/01	1983/04/01
IRVING	JOAN	82/01/04	1983/01/04
JONES	DIANE	82/05/01	1983/05/01
MCCOY	JOHN	81/07/01	1982/07/01
MCKNIGHT	ROGER	82/02/02	1983/02/02
ROMANS	ANTHONY	82/07/01	1983/07/01
SMITH	MARY	81/07/01	1982/07/01
SMITH	RICHARD	82/01/04	1983/01/04
STEVENS	ALFRED	80/06/02	1981/06/02

The following example uses the technique of passing the subroutine a smart date converted to alphanumeric format. The FUSREXX macro called DATEREX2 takes two input arguments: an alphanumeric number of days that represents a smart date, and a number of days to add. It returns a smart date in YYMD format that represents the input date plus the number of days. Both the input date and output date are in REXX base date ('B') format.

The number 693959 represents the number of days difference between the FOCUS base date and the REXX base date:

```
/* REXX DATEREX2 routine. Add indate (original format YYMD) to days */
Arg indate, days .
Return D2C(Date('B',indate+693959,'B') + days - 693959, 4)
```

The following request uses the DATEREX2 macro to calculate the date that is 365 days from the hire date of each employee. The input arguments are the hire date and the number of days to add. Because HIRE_DATE is in I6YMD format, it must be converted to an alphanumeric number of days before being passed to the macro:

```
TABLE FILE EMPLOYEE
PRINT LAST_NAME FIRST_NAME HIRE_DATE
AND COMPUTE
    ADATE/YYMD = HIRE_DATE; NOPRINT
AND COMPUTE
    INDATE/A8 = EDIT(ADATE); NOPRINT
AND COMPUTE
    NEXT_DATE/YYMD = DATEREX2(8,INDATE,3,'365',4,NEXT_DATE);
BY LAST_NAME NOPRINT
END
```

The report output is the same as that produced by the DATEREX1 macro.

Compiling FUSREXX Macros in CMS

The SUM2 FUSREXX macro takes two amounts as input and returns the sum in integer format:

```
/* SUM2 routine. Add amount1 to amount2 and return as integer */
Arg amt1, amt2 .
Return D2C(amt1 + amt2,4)
```

To compile and compress this FUSREXX macro in CMS, issue the following command. Note that the file identifier must be in upper case:

```
rexcomp SUM2 FUSREXX A (condense
```

A FILELIST of SUM2 * A lists the following files:

SUM2	CFUSREXX	A1 F	1024	2	1	1/31/00 12:07:19
SUM2	LISTING	A1 V	121	42	1	1/31/00 12:07:19
SUM2	FUSREXX	A1 F	80	3	1	1/31/00 12:04:19

The file SUM2 FUSREXX is the original source file. The file SUM2 CFUSREXX is the compiled version. To call the compiled version in a FOCUS request, you must rename it to have the file type FUSREXX. The file SUM2 LISTING details the results of the compilation.

To use the compiled version in a FOCUS request, issue the following commands. The EXECLOAD command, which loads the routine into memory and improves performance, is optional:

```
rename sum2 fusrexx a ssum2 fusrexx a
rename sum2 cfusrexx a sum2 fusrexx a
execload sum2 fusrexx a
```

Then, in FOCUS, issue the following request:

```
TABLE FILE EMPLOYEE
PRINT CSAL AND COMPUTE
ASAL/A12 = EDIT(CSAL);
AMOUNT/A4 = '1000';
TOTSAL/I6 = SUM2(12, ASAL, 4, AMOUNT, 4, TOTSAL);
END
```

The output is:

CURR_SAL	ASAL	AMOUNT	TOTSAL
-----	----	-----	-----
\$11,000.00	000000011000	1000	12000
\$13,200.00	000000013200	1000	14200
\$18,480.00	000000018480	1000	19480
\$9,500.00	000000009500	1000	10500
\$29,700.00	000000029700	1000	30700
\$26,862.00	000000026862	1000	27862
\$21,120.00	000000021120	1000	22120
\$18,480.00	000000018480	1000	19480
\$21,780.00	000000021780	1000	22780
\$16,100.00	000000016100	1000	17100
\$9,000.00	000000009000	1000	10000
\$27,062.00	000000027062	1000	28062

NF731: Reporting From Independent Paths

When you report from a multi-path data source, a parent segment may have children down some paths but not others. The new MULTIPATH parameter allows you to control whether such a parent segment is omitted from the report output.

The MULTIPATH setting also affects the processing of selection tests on independent paths. In prior releases, WHERE or IF tests on separate paths were considered independently, as if an OR operator connected them. Therefore, a parent instance was included in the report if at least one of the paths passed its screening test. However the following warning message was produced in those cases:

(FOC144) WARNING. TESTING IN INDEPENDENT SETS OF DATA:

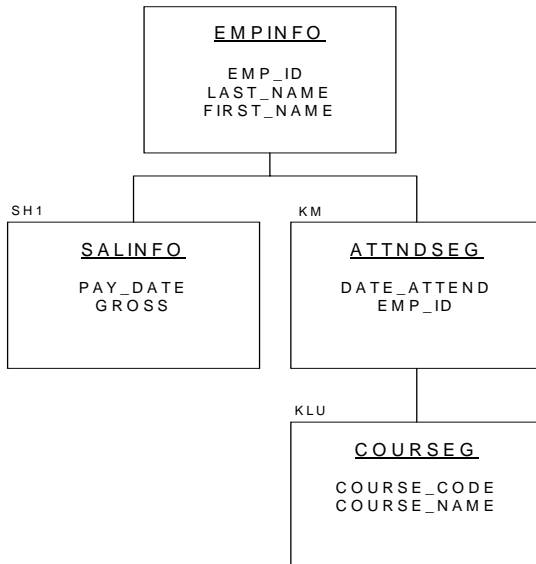
The request contains a test on one path, and retrieves data from another independent path. Records on the independent path will be retrieved regardless of whether the condition is satisfied on the tested path. Setting MULTIPATH = COMPOUND will alter this behavior.

This behavior is consistent with the SIMPLE setting for the MULTIPATH parameter.

The COMPOUND setting for MULTIPATH eliminates the (FOC144) message when testing on independent paths. It also treats screening conditions on separate paths as if they were connected by an AND operator. That is, *all* paths must pass their screening tests in order for the parent to be included in the report output.

Retrieving Data From Multiple Paths

The examples for this feature use the following segments from the EMPLOYEE data source:



Consider the following request that retrieves data from both paths with
MULTIPATH = SIMPLE:

```
SET ALL = OFF
SET MULTIPATH = SIMPLE
TABLE FILE EMPLOYEE
PRINT GROSS IN 18 DATE_ATTEND COURSE_NAME
BY LAST_NAME BY FIRST_NAME IN 12
WHERE PAY_DATE EQ 820831
WHERE COURSE_CODE EQ '103'
END
```

The following warning message is generated:

(FOC144) WARNING. TESTING IN INDEPENDENT SETS OF DATA:

John Banning has taken no courses but he is included in the report output
because he has an instance on one of the two paths:

LAST_NAME	FIRST_NAME	GROSS	DATE_ATTEND	COURSE_NAME
-----	-----	-----	-----	-----
BANNING	JOHN	\$2,475.00	.	.
BLACKWOOD	ROSEMA	\$1,815.00	.	.
CROSS	BARBAR	\$2,255.00	.	.
GREENSPAN	MARY	\$750.00	.	.
IRVING	JOAN	\$2,238.50	.	.
JONES	DIANE	\$1,540.00	82/05/26	BASIC REPORT PREP FOR PROG
MCCOY	JOHN	\$1,540.00	.	.
MCKNIGHT	ROGER	\$1,342.00	.	.
ROMANS	ANTHON	\$1,760.00	.	.
SMITH	MARY	\$1,100.00	81/11/16	BASIC REPORT PREP FOR PROG
	RICHAR	\$791.67	.	.
STEVENS	ALFRED	\$916.67	.	.

If you run the same request with MULTIPATH = COMPOUND, John Banning is omitted from the report output because he has no instances for COURSE_NAME:

LAST_NAME	FIRST_NAME	GROSS	DATE_ATTEND	COURSE_NAME
-----	-----	----	-----	-----
JONES	DIANE	\$1,540.00	82/05/26	BASIC REPORT PREP FOR PROG
SMITH	MARY	\$1,100.00	81/11/16	BASIC REPORT PREP FOR PROG

The (FOC144) warning message is not generated.

Syntax How to Control Multi-path Processing

Issue the SET MULTIPATH command in one of the following ways:

- From the command level or in a stored procedure:

```
SET MULTIPATH = {SIMPLE|COMPOUND}
```

- In a report request:

```
ON TABLE SET MULTIPATH {SIMPLE|COMPOUND}
```

where:

SIMPLE

Includes a parent segment in the report output if:

- It has at least one child that passes its screening conditions.
- It lacks any referenced child on a path, but the child is optional (see [Determining if a Segment Is Required](#)).

SIMPLE is the default value for FOCUS for S/390.

The (FOC144) warning message is generated when a request screens data in a multi-path report.

(FOC144) WARNING. TESTING IN INDEPENDENT SETS OF DATA:

The request contains a test on one path, and retrieves data from another independent path. Records on the independent path will be retrieved regardless of whether the condition is satisfied on the tested path. Setting MULTIPATH = COMPOUND will alter this behavior.

COMPOUND

Includes a parent in the report output if it has *all* of its required children (see [Determining if a Segment Is Required](#)). The COMPOUND setting does not generate the (FOC144) warning message. COMPOUND is the default value for EDA and WebFOCUS.

The segment rule is applied level by level as FOCUS descends the data source/view hierarchy. That is, a parent segment's existence depends on the child segment's existence and the child segment depends on the grandchild's existence, and so on for the full data source tree.

MULTIPATH and SET ALL Combinations

The ALL parameter also affects independent path processing.

The following table uses examples from the EMPLOYEE data source to explain the interaction of ALL and MULTIPATH:

Request	MULTIPATH=SIMPLE	MULTIPATH=COMPOUND
SET ALL = OFF PRINT EMP_ID PAY_DATE DATE_ATTEND	Shows employees who have <i>either</i> SALINFO data <i>or</i> ATTNDSEG data.	Shows employees who have <i>both</i> SALINFO <i>and</i> ATTNDSEG data.
SET ALL = ON PRINT EMP_ID PAY_DATE DATE_ATTEND	Shows employees who have SALINFO data <i>or</i> ATTNDSEG data <i>or</i> no child data at all.	Same as SIMPLE.
SET ALL = OFF PRINT EMP_ID PAY_DATE DATE_ATTEND WHERE PAY_DATE EQ 980115	Shows employees who have <i>either</i> SALINFO data for 980115 <i>or</i> any ATTNDSEG data. Produces (FOC144) message.	Shows employees who have <i>both</i> SALINFO data for 980115 <i>and</i> ATTNDSEG data.
SET ALL = ON PRINT EMP_ID PAY_DATE DATE_ATTEND WHERE PAY_DATE EQ 980115	Shows employees who have <i>either</i> SALINFO data for 980115 <i>or</i> any ATTNDSEG data. Produces (FOC144) message.	Shows employees who have SALINFO data for 980115. Any DATE_ATTEND data is also shown.

Request	MULTIPATH=SIMPLE	MULTIPATH=COMPOUND
SET ALL = OFF PRINT ALL.EMP_ID DATE_ATTEND WHERE PAY_DATE EQ 980115	Shows employees who have <i>either</i> SALINFO data for 980115 <i>or</i> any ATTNDSEG data. Produces (FOC144) message.	Shows employees who have SALINFO data for 980115. Any DATE_ATTEND data is also shown.
SET ALL = ON <i>or</i> OFF PRINT EMP_ID PAY_DATE DATE_ATTEND WHERE PAY_DATE EQ 980115 AND COURSE_CODE EQ '103'	Shows employees who have <i>either</i> SALINFO data for 980115 <i>or</i> COURSE 103. Note: SIMPLE treats the AND in the WHERE clause as an OR. Produces (FOC144) message.	Shows employees who have <i>both</i> SALINFO data for 980115 <i>and</i> COURSE 103.

Note: SET ALL = PASS is not supported with MULTIPATH = COMPOUND.

Determining if a Segment Is Required

FOCUS determines if a segment is required or optional using the following rules:

- When SET ALL is ON or OFF, a segment with WHERE or IF criteria is required for its parent, and all segments up to the root segment are required for their parents.
When SET ALL = PASS, a segment with WHERE or IF criteria is optional.
- IF SET ALL = ON or PASS, all referenced segments with no IF or WHERE criteria are optional for their parents (outer join).
- IF SET ALL = OFF, all referenced segments are required (inner join).
- A referenced segment can become optional if its parent segment uses the ALL. field prefix operator.

Note: ALL = PASS is not supported for all data adapters and, if it is supported, it may behave slightly differently. Check your specific data adapter documentation for detailed information.

Reference Environments That Support MULTIPATH = COMPOUND

- The MULTIPATH setting works with all types of data sources and in all reporting environments (TABLE, TABLEF, AUTOTABLEF, MATCH, MORE, GRAPH, requests with multiple display commands). It works with alternate views, indexed views, filters, DBA, and joined structures.
- A unique segment is considered a part of its parent segment and, therefore, does not invoke independent path processing.

Reference Requirements and Notes for MULTIPATH = COMPOUND

- The minimum memory requirement for the MULTIPATH = COMPOUND setting is 4K per active segment. If there is insufficient memory, the SIMPLE setting is implemented and the following message is returned:

(FOC36263) *Insufficient memory for independent path cache.*

There is not enough memory to build a cache for independent paths. Processing will proceed as if MULTIPATH were SIMPLE.

There is no limit to the *number* of segment instances (rows); however, no single segment instance can have more than 4K of active fields (referenced fields or fields needed for retrieving referenced fields). If this limit is exceeded, the SIMPLE setting is implemented and the following message is returned:

(FOC36264) *A segment's active fields are larger than the cache limit.*

One segment has more than 4000 bytes of active data.

Processing will proceed as if MULTIPATH were SIMPLE.

- SET MULTIPATH = COMPOUND creates a pool boundary when reports are pooled.
- WHERE criteria that screen on more than one path with the OR operator are not supported.

NF749: HOLD FORMAT INTERNAL

FOCUS HOLD files pad binary and packed data values to a full word boundary. For example, a three-digit integer field (I3), is stored as four bytes in a HOLD file. In order for third generation programs, such as COBOL, to be able to read FOCUS extract files in an exact manner, you can save the fields in the HOLD file without any padding.

Syntax How to Save a File Without Padding

Issue a report request specifying format overrides for the integer and packed fields that should not be padded and include the following:

```
ON TABLE HOLD AS name FORMAT INTERNAL
```

Syntax How to Ensure Accurate Display of Your Request

```
SET HOLDLIST = PRINTONLY
```

Setting HOLDLIST to PRINTONLY causes your report request to propagate the HOLD file with only the fields that would display in the report output as you specified. If you do not issue this setting, an extra field containing the padded field length is included in the HOLD file.

Reference How to Use Format Overrides

1. Integer fields (I) of one, two, three, or four bytes produce four byte integers.
2. HOLD FORMAT INTERNAL does not affect floating point double precision (D) and floating point single precision (F) fields. D remains at eight bytes and F at four bytes. Alpha fields are also not affected by HOLD FORMAT INTERNAL.

3. For packed decimal fields (Px.y), x is the total number of digits and y is the number of digits to the right of the decimal point. The number of bytes is derived by dividing x by 2 and adding 1.

`bytes = INT (x/2) + 1`

where:

`INT (x/2)` is the greatest integer after dividing by 2.

4. Alphanumeric fields automatically inherit their length from their source Master File and are not padded to a full word boundary.

Example Creating a HOLD File Without HOLD FORMAT INTERNAL

```
TABLE FILE CAR
PRINT CAR COUNTRY RETAIL_COST DEALER_COST SEATS
ON TABLE HOLD AS DJG
END
```

The request creates the following Master File:

```
FILE=DJG                      ,SUFFIX=FIX
SEGNAME=DJG                   ,SEGTYPE=S0

FIELDNAME  =CAR                ,E01          ,A16          ,A16          , $
FIELDNAME  =COUNTRY            ,E02          ,A10          ,A12          , $
FIELDNAME  =RETAIL_COST        ,E03          ,D7           ,D08          , $
FIELDNAME  =DEALER_COST        ,E04          ,D7           ,D08          , $
FIELDNAME  =SEATS              ,E05          ,I3           ,I04          , $
```

The values of ACTUAL for RETAIL_COST, DEALER_COST, and SEATS are all padded to a full word in binary.

Example Creating a HOLD File With HOLD FORMAT INTERNAL

In this example, DEALER_COST and RETAIL_COST are defined in the Master File as D fields, but the request overrides RETAIL_COST as an I2 field and DEALER_COST as a P3 field.

```
SET HOLDLIST=PRINTONLY
TABLE FILE CAR
PRINT CAR COUNTRY RETAIL_COST/I2 DEALER_COST/P3 SEATS/I1
ON TABLE HOLD AS HINT3 FORMAT INTERNAL
END
```

This creates the following Master File:

```
FILE=HINT3                ,SUFFIX=FIX
SEGNAME=HINT3             ,SEGTYPE=S0

FIELDNAME   =CAR           ,E01           ,A16           ,A16           , $
FIELDNAME   =COUNTRY       ,E02           ,A10           ,A10           , $
FIELDNAME   =RETAIL_COST   ,E03           ,I6            ,I02           , $
FIELDNAME   =DEALER_COST   ,E04           ,P4            ,P02           , $
FIELDNAME   =SEATS         ,E05           ,I4            ,I01           , $
```

The values of ACTUAL for the overridden fields are I2 and P2.

DEALER_COST has an ACTUAL of P2 because the format override, P3, means 3 display digits that can be stored in 2 actual digits.

If a format override is not large enough to contain the data values, the values are truncated. Truncation may cause the data in the HOLD file to be incorrect in the case of an integer. For packed data and integers, truncation occurs for the high order digits so the remaining low order digits will resemble the digits from the correct values.

For example, consider this next request:

```
SET HOLDLIST=PRINTONLY
TABLE FILE CAR
PRINT CAR COUNTRY RETAIL_COST/I1 DEALER_COST/P3 SEATS/I1
ON TABLE HOLD AS HINT4 FORMAT INTERNAL
END
```

RETAIL_COST and SEATS are overridden with format I1 and DEALER_COST is overridden with format P3. These formats for RETAIL_COST and DEALER_COST are not large enough to contain the data values for these fields.

The following Master File is produced:

```
FILE=HINT4          ,SUFFIX=FIX
SEGNAME=HINT4      ,SEGTYPE=S0
FIELDNAME   =CAR          ,E01          ,A16          ,A16          , $
FIELDNAME   =COUNTRY      ,E02          ,A10          ,A10          , $
FIELDNAME   =RETAIL_COST  ,E03          ,I4          ,I01          , $
FIELDNAME   =DEALER_COST  ,E04          ,P4          ,P02          , $
FIELDNAME   =SEATS        ,E05          ,I4          ,I01          , $
```

The following is a sampling of the output when reporting from this HOLD file:

CAR	COUNTRY	RETAIL_COST	DEALER_COST	SEATS
---	-----	-----	-----	-----
JAGUAR	ENGLAND	174	427	2
JAGUAR	ENGLAND	179	194	5
JENSEN	ENGLAND	186	940	4
TRIUMPH	ENGLAND	236	296	2
DATSUN	JAPAN	67	626	4
TOYOTA	JAPAN	11	886	4
ALFA ROMEO	ITALY	164	660	2
ALFA ROMEO	ITALY	164	660	2
ALFA ROMEO	ITALY	37	915	4

The values displayed for RETAIL_COST and DEALER_COST do not represent the actual values in the original data source. This is due to truncation of the binary integer representation of the data values for RETAIL_COST, and truncation of the high order digits for DEALER_COST.

For example, a RETAIL_COST of 8878 is 10001010101110 in binary. To fit this into an I1 field as stated in the prior TABLE request, the value is 10101110. So the high order 100010 is truncated. Now, the decimal value of 100010 is 174, which is why the first record displayed shows a RETAIL_COST of 174.

For a DEALER_COST of 7427 to fit in a P2 ACTUAL, the high order digit, 7, is truncated, leaving the low order digits, 427. This is why the first record displayed shows a DEALER_COST of 427.

NF750: DATASET in a Master File

You can add the DATASET attribute to the Master File to specify a physical location for the data source to be allocated. In addition, the DATASET attribute permits you to bypass the FOCUS search mechanism for default data source location. DATASET eliminates the need to allocate data sources using JCL, FILEDEF, DYNAM, and USE commands.

User allocation and system specific behavior is as follows:

Platform	User allocation command
CMS	FILEDEF
TSO	DYNAM ALLOC or TSO ALLOC

Note: The MODIFY FIND function does not work with the DATASET attribute. To use FIND with a data source, you must manually allocate the data source.

DATASET Behavior in FOCUS Data Sources

The DATASET attribute can be used only on the file level of the Master File. If the Master File's name is present in the USE list, or the user explicitly allocated the Master File, a warning is issued and the DATASET attribute is ignored.

If DATASET is used in a Master File whose data source is managed by the FOCUS Database Server, the DATASET attribute is ignored on the server side because the FOCUS Database Server does not read Master Files for servicing table requests.

The DATASET attribute in the Master File has the lowest priority:

- A user's explicit allocation overrides DATASET attributes.
- The USE command for FOCUS data sources overrides DATASET attributes and explicit allocations.

An alternative to the DATASET attribute for allocating FOCUS data sources is an Access File. For detailed information, see [NF777: Partitioned FOCUS Data Sources](#). DATASET and ACCESSFILE are mutually exclusive attributes in the Master File; that is, you can use at most one of them, not both.

Note: If a DATASET allocation is in effect, a CHECK FILE command must be issued in order to override it by an explicit allocation command. The CHECK FILE command will de-allocate the allocation created by DATASET.

Syntax How to Use the DATASET Attribute

```
{DATASET|DATA}='filename [ON sinkname]'
```

where:

filename

Is the platform-dependent physical name of the data source.

sinkname

Indicates that the data source is located on the FOCUS Database Server.

This attribute is valid for FOCUS data sources.

In MVS, the syntax is:

```
{DATASET|DATA}='qualifier.qualifier ...'
```

or

```
{DATASET|DATA}='ddname ON sinkname'
```

In CMS, the syntax is:

```
{DATASET|DATA}='filename filetype filemode [ON sinkname]'
```

Example Allocating a FOCUS Data Source Using the DATASET Attribute

The following example illustrates how to allocate a FOCUS data source using the DATASET attribute:

For MVS,

```
FILENAME=CAR,SUFFIX=FOC
DATASET='USER1.CAR.FOCUS'
SEGNAME=ORIGIN,SEGTYPE=S1
FIELDNAME=COUNTRY,COUNTRY,A10,FIELDTYPE=I,$
SEGNAME=COMP,SEGTYPE=S1,PARENT=ORIGIN
FIELDNAME=CAR,CARS,A16,$
SEGNAME=CARREC,SEGTYPE=S1,PARENT=COMP
.
.
.
```

For CMS,

```
FILENAME=CAR,SUFFIX=FOC
DATASET='CAR FOCUS A'
SEGNAME=ORIGIN,SEGTYPE=S1
FIELDNAME=COUNTRY,COUNTRY,A10,FIELDTYPE=I,$
SEGNAME=COMP,SEGTYPE=S1,PARENT=ORIGIN
FIELDNAME=CAR,CARS,A16,$
SEGNAME=CARREC,SEGTYPE=S1,PARENT=COMP
.
.
.
```


Example Allocating a Data Source For the FOCUS Database Server

The following example illustrates how to allocate a FOCUS data source with the DATASET attribute using ON *sink*:

For MVS,

```
FILENAME=CAR,SUFFIX=FOC
DATASET='CAR ON SINK1'
SEGNAME=ORIGIN,SEGTYPE=S1
FIELDNAME=COUNTRY,COUNTRY,A10,FIELDTYPE=I,$
SEGNAME=COMP,SEGTYPE=S1,PARENT=ORIGIN
FIELDNAME=CAR,CARS,A16,$
SEGNAME=CARREC,SEGTYPE=S1,PARENT=COMP
.
```

Note: The ddname CAR is allocated by the FOCUS Database Server JCL.

For CMS,

```
FILENAME=CAR,SUFFIX=FOC
DATASET='CAR FOCUS A ON SINK1'
SEGNAME=ORIGIN,SEGTYPE=S1
FIELDNAME=COUNTRY,COUNTRY,A10,FIELDTYPE=I,$
SEGNAME=COMP,SEGTYPE=S1,PARENT=ORIGIN
FIELDNAME=CAR,CARS,A16,$
SEGNAME=CARREC,SEGTYPE=S1,PARENT=COMP
.
```

DATASET Behavior in Fixed-Format Sequential Data Sources

The DATASET attribute must appear on the file level of the Master File and cannot contain ON *sink*. If the DATASET attribute contains ON *sink*, an error message is issued and the operation is terminated.

When FOCUS detects the DATASET attribute, FOCUS checks for an explicit allocation of data for this Master File. If an explicit allocation exists, a warning message is issued informing the user that the DATASET value has been overridden and the DATASET attribute is ignored. If this Master File name is not allocated, an internal command is issued to perform the allocation. This allocation is stored temporarily and is released when a new Master File is used or when the FOCUS session terminates.

Syntax How to Use the DATASET Attribute With Fixed-Format Data Sources

```
{DATASET|DATA}='filename'
```

where:

filename

Is the platform-dependent physical name of the data source.

The DATASET attribute in the Master File has the lowest priority:

- A user's explicit allocation overrides DATASET attributes.

Note: If a DATASET allocation is in effect, a CHECK FILE command must be issued in order to override it by an explicit allocation command. The CHECK FILE command will de-allocate the allocation created by DATASET.

Example Allocating a Fixed-Format Data Source Using the DATASET Attribute

The following example illustrates how to allocate a fixed-format data source using the DATASET attribute:

1. `FILE=XX, SUFFIX=FIX, DATASET='SEQFILE1 DATA A'`
.
.
.
2. `FILE=XX, SUFFIX=FIX, DATASET='USER1.SEQFILE1'`
.
.
.

DATASET Behavior in VSAM Data Sources

The DATASET attribute must appear on the file level of the Master File and cannot contain ON *sink*. If the DATASET attribute contains ON *sink*, an error message is issued and the operation is terminated.

When FOCUS detects the DATASET attribute, FOCUS checks for an explicit allocation of data for this Master File. If an explicit allocation is found, a warning message is issued informing the user that the DATASET value has been overridden and the DATASET attribute is ignored. If this Master File name is not allocated, an internal command is issued to perform the allocation. This allocation is stored temporarily and is released when a new Master File is used or when the FOCUS session terminates.

The DATASET attribute may also appear on the field level of the Master File to specify where to find an alternate index. Because of VSAM naming conventions (truncated to 8 characters), the name of the field alias will be used as the ddname. If a user allocation is found for the Master File or alternate index ddname, the DATASET attribute is ignored and a warning message issued.

Note: There is no limit on how many alternate indices you may have. It is also acceptable for some alternate indices to have the DATASET attribute and others not. However, if a file level DATASET attribute is missing, the field level DATASET will be ignored.

Syntax **How to Use the DATASET Attribute With VSAM Data Sources**

```
{DATASET|DATA}='filename'
```

where:

filename

Is the platform-dependent physical name of the data source or alternate index.

The DATASET attribute in the Master File has the lowest priority:

- A user's explicit allocation overrides DATASET attributes.

Note: If a DATASET allocation is in effect, a CHECK FILE command must be issued in order to override it by an explicit allocation command. The CHECK FILE command will de-allocate the allocation created by DATASET.

Example Allocating a VSAM Data Source Using the DATASET Attribute

The following example illustrates how to allocate a VSAM data source on the file level and for an alternate index:

```
FILE=EXERVSM1, SUFFIX=VSAM, DATASET='VSAM1.CLUSTER1', $
SEGNAME=ROOT, SEGTYPE=S0, $
GROUP=KEY1, ALIAS=KEY, FORMAT=A4, ACTUAL=A4, $
FIELD=FLD1, ALIAS=F1, FORMAT=A4, ACTUAL=A4, $
FIELD=FLD2, ALIAS=F2, FORMAT=A4, ACTUAL=A4, $
FIELD=FLD3, ALIAS=DD1, FORMAT=A4, ACTUAL=A4, FIELDTYPE = I,
    DATASET='VSAM1.INDEX1', $
FIELD=FLD4, ALIAS=F4, FORMAT=A4, ACTUAL=A4, $
FIELD=FLD5, ALIAS=F5, FORMAT=A4, ACTUAL=A4, $
FIELD=FLD6, ALIAS=F6, FORMAT=A4, ACTUAL=A4, $
FIELD=FLD7, ALIAS=F7, FORMAT=A4, ACTUAL=A4, $
```

Reference Error Messages

(FOC1920) ERROR ALLOCATING FILE %1 AS %2

System could not complete an internal allocation command.
Check file name, allocation, and attributes.

(FOC1921) ERROR PARSING DATASET IN MASTER %1: %2

Error occurred while analyzing value of DATASET. Check the
Master File for spelling errors.

(FOC1922) FOCUS DATASET INTERNAL ERROR: %1

A serious problem occurred processing the FOCUS DATASET.

(FOC1925) DATASET ERROR: PHYSICAL NAME SPECIFIED WITH 'ON' CLAUSE

Use a ddanme instead of the physical file name in DATASET when ON *sinkname* clause is present.

Reference Warning Messages

(FOC1923) WARNING: USE COMMAND OVERRIDES DATASET VALUE IN %1

DATASET value in Master File has been overridden by USE command.

(FOC1924) WARNING: ALLOCATION OF %1 OVERRIDES DATASET VALUE IN %1

DATASET value in Master File has been overridden by user's allocation.

NF751: Date-Time Data Type

Topics:

- Describing Date-Time Values
- Setting Date-Time Options
- Manipulating Date-Time Values

The new date-time data type supports both the date and time, similar to the timestamp data types available in many relational data sources.

Date-time fields are stored in eight or ten bytes, four digits for date and either four or six digits for time, depending on whether the format specifies microseconds.

New subroutines are provided for manipulating date-time fields.

Describing Date-Time Values

In a Master File, the USAGE format for a date-time field describes which components to display and various options for displaying them. In Master Files for non-FOCUS data sources, date-time fields must also have an ACTUAL format that indicates how the date-time value is stored in the non-FOCUS data source.

The MISSING attribute for date-time fields can be ON or OFF. If it is OFF, and the date-time field has no value, it defaults to blank.

This section discusses:

- USAGE formats for displaying date-time field values.

- Alphanumeric formats for date-time values entered by a user at a terminal, read from a transaction file, or embedded in an expression.
- ACTUAL formats for date-time fields.

Date-Time Display Formats

The USAGE (or FORMAT) attribute determines how date-time field values are displayed in report output and forms, and how they behave in expressions and functions; for FOCUS data sources, it also determines how they are stored. A new format type, H, describes date-time fields. The USAGE attribute for a date-time field contains the H format code and can identify either the length of the field or the relevant date-time display options.

The USAGE attribute can be one of the following

USAGE = Hnn

USAGE = Htimefmt1

USAGE = Hdatefmt [separator] [timefmt2]

where:

Hnn

Is the USAGE value for a numeric date-time value without date-time display options. This format is appropriate for use in alphanumeric HOLD files or transaction files.

nn is the field length, from 1 to 20, including up to eight characters for displaying the date and up to nine or 12 characters for the time. For lengths less than 20, the date is truncated on the right.

An eight-character date includes four digits for the year, two digits for the month, and two digits for the day of the month, YYYYMMDD.

A nine-character time includes two digits for the hour, two digits for the minute, two digits for the second, and three digits for the millisecond, HHMMSSsss. The millisecond component represents the decimal portion of the second to three places.

A twelve-character time includes two digits for the hour, two digits for the minute, two digits for the second, three digits for the millisecond, and three digits for the microsecond, HHMMSSssssmmm. The millisecond component represents the decimal portion of the second value to three places. The microsecond component represents three additional decimal places beyond the millisecond value.

With this format, there are no spaces between the date and time components, no decimal points, and no spaces or separator characters within either component. The time must be entered using the 24-hour system. For example, the value `19991231225725333444` represents `1999/12/31 10:57:25.333444PM`

Htimefmt1

Is the USAGE format for displaying time only. Hour, minute, and second components are always displayed separated by colons (:), with no intervening blanks.

Unless you specify one of the AM/PM time display options, the time component is displayed using the 24-hour system.

When the format includes more than one time display option:

- The options must appear in the order hour, minute, second, millisecond, microsecond.
- The first option must be either hour, minute, or second.
- No intermediate component can be skipped. That is, if hour is specified the next option must be minute, it cannot be second.

The following table lists the valid time display options for a time-only USAGE attribute. Assume the time value is 2:05:27.123456 a.m.

Option	Meaning	Effect
H	hour (two digits) If the format includes the option <code>a</code> or <code>A</code> , the hour value is from 01 to 12. Otherwise, the hour value is from 00 to 23, with 00 representing midnight.	Prints a two-digit hour. For example: <code>USAGE = HH</code> prints <code>02</code>
h	hour with zero suppression If the format includes the option <code>a</code> or <code>A</code> , the hour value is from 1 to 12. Otherwise, the hour is from 0 to 23.	Displays the hour with zero suppression. For example: <code>USAGE = Hh</code> prints <code>2</code>
I	minute (two digits) The minute value is from 00 to 59.	Prints the two-digit minute. For example: <code>USAGE = HHI</code> prints <code>02:05</code>

Option	Meaning	Effect
i	minute with zero suppression The minute value is from 0 to 59.	Prints the minute with zero suppression. Cannot be used together with an hour format (H or h). For example: USAGE = Hi prints 5
S	Second (two digits) 00 to 59	Prints the two-digit second. For example: USAGE = HHIS prints 02:05:27
s	millisecond (three digits — after the decimal point in the second) 000 to 999	Prints the second to three decimal places. For example: USAGE = HHISs prints 02:05:27.123
m	microsecond (three additional digits after milliseconds) 000 through 999	Prints the second to six decimal places. For example: USAGE = HSsm prints 27.123456
A	12-hour time display with AM or PM in upper case	Prints hours from 01 to 12 followed by AM or PM. For example: USAGE = HHISA prints 02:05:27AM

Option	Meaning	Effect
a	12-hour time display with am or pm in lower case	Prints hours from 01 to 12 followed by am or pm. For example: <code>USAGE = HHISa</code> prints <code>02:05:27am</code>

Hdatefmt

Is the USAGE format for displaying the date portion of the date-time field. The date components can be in any of the following combinations and order:

- Year first combinations: Y, YY, YM, YYM, YMD, YYMD
- Month-first combinations: M, MD, MY, MYY, MDY, MDYY
- Day-first combinations: D, DM, DMY, DMY

The date format can include the following display options as long as they conform to the allowed combinations. In the following table, assume the date is February 5, 1999.

Option	Meaning	Example
Y	2-digit year	99
YY	4-digit year	1999
M	2-digit month (01 - 12)	02
MT	Full month name	February

Option	Meaning	Example
Mt	Short month name	Feb
D	2-digit day	05
d	zero-suppressed day	5
k	For formats in which month or day is followed by year and month is translated to a short or full name, separates the year from the day with a comma and blank. Otherwise the separator is a blank.	USAGE = HMTdKYY prints Feb 05, 1999

separator

Is a separator between the date components. The default separator is a slash (/). Other valid separators are: period (.), hyphen (-), blank (B), or none (N). With translated months, these separators can only be specified when the k option is not used.

timefmt2

Is the format for a time that follows a date. Time is separated from the date by a blank; time components are separated from each other by colons. Unlike the format for time alone, a time format that follows a date format consists of at most two characters: a single character to represent all of the time components to be displayed and, optionally, one character for an AM/PM option. The following table lists the valid options. Assume the date is February 5, 1999 and the time is 02:05:25.444555 a.m.

Option	Meaning	Example
H	Prints hour	USAGE = HYYMDH prints 1999/02/05 02
I	Prints hour:minute	USAGE = HYYMDI prints 1999/02/05 02:05
S	Prints hour:minute:second	USAGE = HYYMDS prints 1999/02/05 02:05:25
s	Prints hour:minute:second.millisecond	USAGE = HYYMDs prints 1999/02/05 02:05:25.444
m	Prints hours:minutes:seconds.micro seconds	USAGE = HYYMDm prints 1999/02/05 02:05:25.444555

Option	Meaning	Example
A	Prints AM or PM. Uses the 12-hour system and causes the hour to be printed with zero suppression.	<code>USAGE = HYYMDSA</code> prints <code>1999/02/05 2:05:25AM</code>
a	Prints am or pm. Uses the 12-hour system and causes the hour to be printed with zero suppression.	<code>USAGE = HYYMDSa</code> prints <code>1999/02/05 2:05:25am</code>

Note: Unless you specify one of the AM/PM time display options, the time component is displayed using the 24-hour system.

Specifying Date-Time Values

An external date-time value is a constant in character format from one of the following sources:

- A sequential data source.
- Typed by an application user at a terminal or workstation.
- Used in an expression in a WHERE clause, an IF clause, a DEFINE, or a COMPUTE.

A date-time constant typed by an application user at a terminal or workstation, or a date-time value as it appears in a character file has one of the following formats

```
date_string  [time_string]  
time_string  [date_string]
```

A date-time constant in a COMPUTE, DEFINE, or WHERE expression must have one of the following formats.

```
DT(date_string [time_string])  
DT(time_string [date_string])
```

A date-time constant in an IF expression has one of the following formats:

```
'date_string [time_string]'  
'time_string [date_string]'
```

If the value contains no blanks or special characters, the single quotation marks are not necessary. Note that the DT prefix is not supported in IF criteria.

where:

time_string

Cannot contain blanks. Time components are separated by colons and may be followed by AM, PM, am, or pm. For example:

```
14:30:20:99          (99 milliseconds)  
14:30  
14:30:20.99          (99/100 seconds)  
14:30:20.999999      (999999 microseconds)  
02:30:20:500pm
```

Note that seconds can be expressed with a decimal point or be followed by a colon.

- If there is a colon after seconds, the value following it represents milliseconds. There is no way to express microseconds using this notation.
- A decimal point in the seconds value indicates the decimal fraction of a second. Microseconds can be represented using six decimal digits.

date_string

Can have one of the following three formats:

- The **numeric string format** is exactly four, six, or eight digits. Four-digit strings are considered to be a year (century must be specified); the month and day are set to January 1. Six and eight-digit strings contain two or four digits for the year, followed by two for the month, and then two for the day. Because the component order is fixed with this format, the DATEFORMAT setting described in [How to Specify the Order of Date Components in Formatted Input Values](#) is ignored.

If a numeric-string format longer than eight digits is encountered, it is treated as a combined date-time string in the `Hnn` format described in [Describing Date-Time Values](#). The following are examples of numeric string date constants:

```
99
1999
19990201
```

- The **formatted-string format** contains a one or two-digit day, a one or two-digit month, and a two or four-digit year separated by spaces, slashes, hyphens, or periods. All three parts must be present and follow the DATEFORMAT setting described in [How to Specify the Order of Date Components in Formatted Input Values](#). If any of the three fields is four digits, it is interpreted as the year, and the other two fields must follow the order given by the DATEFORMAT setting. The following are examples of formatted-string date constants:

```
1999/05/20
5 20 1999
99.05.20
1999-05-20
```

- The **translated-string format** contains the full or abbreviated month name. The year must also be present in four-digit or two-digit form. If the day is missing, day 1 of the month is assumed; if present, it can have one or two digits. If the string contains both a two-digit year and a two-digit day, they must be in the order given by the DATEFORMAT setting. For example:

January 6 2000

Note:

- The date and time strings must be separated by at least one blank space. Blank spaces are also permitted at the beginning and end of the date-time string.
- In each date format, two-digit years are interpreted using the [F]DEFECENT and [F]YRTHRESH settings.

Example Reading Date-Time Values From a Transaction File

The DTTRANS comma-delimited transaction file has an ID field and a date-time field that contains both the date (as eight characters) and time (in the format hour:minute:second):

```
01, 20000101 02:57:25,$  
02, 19991231 14:05:35,$
```

Because the transaction file contains the dates in numeric string format the DATEFORMAT setting is not used, and the dates are entered in YMD order.

The following transaction file is also valid. It contains formatted string dates that comply with the default DATEFORMAT setting, MDY:

```
01, 01/01/2000 02:57:25,$  
02, 12/31/1999 14:05:35,$
```

The following Master File describes the FOCUS data source named DATETIME, which will receive these values:

```
FILE=DATETIME,      SUFFIX=FOC      , $
SEGNAME=DATETIME,   SEGTYPE=S0      , $
FIELD=ID,   ID,      USAGE = I2     , $
FIELD=DT1,  DT1,     USAGE=HYYMDS   , $
```

The following MODIFY procedure loads the transaction values into the FOCUS data source:

```
-* THE FOLLOWING ALLOCATION AND CREATE FILE IS NEEDED FOR THE TRANSACTION
FILE
-* ON MVS
-* DYNAM ALLOC DD DTTRANS DA USER1.DTTRANS SHR REUSE
-* CREATE FILE DATETIME
-* THE FOLLOWING FILEDEF IS NEEDED FOR THE TRANSACTION FILE ON CMS
CMS FILEDEF DTTRANS DISK DTTRANS DATA A
MODIFY FILE DATETIME
    FREEFORM ID DT1
DATA ON DTTRANS
END
```

To see the printed values, issue the following request:

```
TABLE FILE DATETIME
PRINT ID DT1
END
```

The output is:

```
ID   DT1
--   ---
 1   2000/01/01 02:57:25
 2   1999/12/31 14:05:35
```

Example Using a Date-Time Value in a COMPUTE Command

```
TABLE FILE EMPLOYEE
PRINT LAST_NAME FIRST_NAME AND COMPUTE
NEWSAL/D12.2M = CURR_SAL + (0.1 * CURR_SAL);
RAISETIME/HYMDIA = DT(20000101 09:00AM);
WHERE CURR_JOBCODE LIKE 'B%'
END
```

The output is:

LAST_NAME	FIRST_NAME	NEWSAL	RAISETIME
-----	-----	-----	-----
SMITH	MARY	\$14,520.00	2000/01/01 9:00AM
JONES	DIANE	\$20,328.00	2000/01/01 9:00AM
ROMANS	ANTHONY	\$23,232.00	2000/01/01 9:00AM
MCCOY	JOHN	\$20,328.00	2000/01/01 9:00AM
BLACKWOOD	ROSEMARIE	\$23,958.00	2000/01/01 9:00AM
MCKNIGHT	ROGER	\$17,710.00	2000/01/01 9:00AM

Example Using a Date-Time Value in WHERE Criteria

In a WHERE clause, a date-time constant must use the DT() format:

```
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE
WHERE TRANSDATE GT DT(2000/01/01 02:57:25)
END
```

The output is:

CUSTID	TRANSDATE
-----	-----
1118	2000/06/26 05:45
1237	2000/02/05 03:30

Example Using a Date-Time Value in IF Criteria

In an IF clause, a date-time constant must be enclosed in single quotation marks if it contains any blanks:

```
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE
IF TRANSDATE GT '2000/01/01 02:57:25'
END
```

Note: The DT prefix for a date-time constant is not supported in an IF clause.

The output is:

```
CUSTID  TRANSDATE
-----
1118    2000/06/26 05:45
1237    2000/02/05 03:30
```

ACTUAL Formats for Date-Time Values

ACTUAL formats supported for date-time values are:

- *Ann*, H8, H10, and H12. *Ann* accepts all the date-time string formats described in [How to Specify the Order of Date Components in Formatted Input Values](#), as well as the *Hnn* USAGE display format described in [Describing Date-Time Values](#). ACTUAL=H8, H10, or H12 accepts a date-time field as it occurs in a binary HOLD file or SAVB file. ACTUAL=*Ann* accepts a date-time field as it occurs in an alphanumeric HOLD file or SAVE file.

Example Creating a Binary HOLD File Containing a Date-Time Field

The following request creates a binary HOLD file using the VIDEOTR2 data source:

```
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE
ON TABLE HOLD AS DTHOLD
END
```

The DTHOLD Master File created from this request contains the ACTUAL format H8 for the TRANSDATE date-time field:

```
FILE=DTHOLD          , SUFFIX=FIX
SEGNAME=DTHOLD      , SEGTYPE=S0
FIELDNAME   =CUSTID          , E01          , A4          , A04          , $
FIELDNAME   =TRANSDATE       , E02          , HYYMDI       , H08          , $
```

Example Creating an Alphanumeric HOLD File Containing a Date-Time Field

The following request creates an alphanumeric HOLD file using the VIDEOTR2 data source:

```
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE
ON TABLE HOLD AS DTALPHA FORMAT ALPHA
END
```

The DTALPHA Master File created from this request contains the ACTUAL format A17 for the TRANSDATE date-time field. The ACTUAL format is A20 if the time format includes microseconds, A17 otherwise (padded with low order zeros if necessary):

```
FILE=DTALPHA          ,SUFFIX=FIX
SEGNAME=DTALPHA ,SEGTYPE=S0
FIELDNAME   =CUSTID      ,E01          ,A4          ,A04          , $
FIELDNAME   =TRANSDATE   ,E02          ,HYMDI        ,A17          , $
```

Setting Date-Time Options

Three parameter settings determine how to interpret a date-time value and manipulate it in requests:

- DATEFORMAT specifies the order of the date components.
- WEEKFIRST assigns a day to be considered the first day of the week in date-time computations involving weeks.
- DTSTRICT controls whether values are error checked (for example, whether the day portion of a date is within the correct number of days for the specified month).

Syntax How to Specify the Order of Date Components in Formatted Input Values

The DATEFORMAT parameter specifies the order of the date components (month/day/year) when date-time values are entered in the formatted string and translated string formats described in [Describing Date-Time Values](#). It makes a value's input format independent of the format of the variable to which it is being assigned. The syntax is

```
SET DATEFORMAT = datefmt
```

where:

datefmt

Can be one of the following: MDY, DMY, YMD, or MYD. The U. S. English default format is MDY.

Syntax **How to Specify the First Day of the Week**

The WEEKFIRST parameter is used in week computations by the HDIFF, HNAME, HPART, and HSETPT functions described in [Date-Time Functions](#). For an example, see [Extracting the Week Component With Different WEEKFIRST Settings](#). The values from 1 to 7 represent Sunday through Saturday. The syntax is

```
SET WEEKFIRST = number
```

where:

number

Is a number from one to seven, where one represents Sunday and seven represents Saturday. The U. S. English default value is seven (Saturday) meaning that Saturday is the first day of each week, so every Friday-Saturday transition is the start of a new week.

The WEEKFIRST setting does not change the number that corresponds to each day of the week, it just specifies which one is considered the start of the week. The default of Saturday (7) as the first day of the week is consistent with the Microsoft SQL Server convention.

Syntax How to Control Error Checking of Date-Time Values

The DTSTRICT parameter controls how much error checking is done on date-time values when they are input by users, read from an alphanumeric transaction file, displayed, or used in user-written subroutines. The syntax is

```
SET DTSTRICT = {ON|OFF}
```

where:

ON

Invokes strict processing. This means that whenever a date-time value is input by a user, read from a transaction file, displayed, or returned by a subroutine it is checked to make sure that the value represents a valid date and time. For example, a numeric month must be between 1 and 12, and the day must be within the number of days for the specified month. ON is the default value. If you attempt to enter a value that violates this rule, the following message displays:

```
(FOC177) INVALID DATE CONSTANT: dt_constant
```

OFF

Does not invoke strict processing. Any date-time component can have any value within the constraint of the number of decimal digits allowed; for example, the month value can be 00 or 13 or 99, but not 115. Furthermore, the values do not have to be consistent; for example, any month in any year can have 30 or 31 days.

Manipulating Date-Time Values

The only direct operations that can be performed on date-time variables and constants are comparison using a logical expression and simple assignment of the form $A = B$. All other operations are accomplished through a set of date-time functions.

Comparison and Assignment

Any two date-time values can be compared, even if their lengths do not match. If a date-time field supports missing values, fields that contain the missing value have a greater value than any date-time field can have.

Therefore, in order to exclude missing values from the report output when using a GT or GE operator in a selection test, it is recommended that you add the additional constraint *field* NE MISSING to the selection test:

```
date_time_field {GT|GE} date_time_value AND date_time_field NE MISSING
```

Assignments are permitted between date-time formats of equal or different lengths. Assigning a 10-byte date-time value to an 8-byte date-time value truncates the microsecond portion (no rounding takes place). Assigning a short value to a long one sets the low-order three digits of the microseconds to zero.

Other operations, including arithmetic, concatenation, EDIT, and LIKE on date-time operands are not supported. Prefix operators that work with alphanumeric fields are supported.

Example Testing for Missing Date-Time Values

Consider the DATETIM2 Master File:

```
FILE=DATETIM2, SUFFIX=FOC , $
SEGNAME=DATETIME, SEGTYPE=S0 , $
FIELD=ID, ID, USAGE = I2 , $
FIELD=DT1, DT1, USAGE=HYMDS, MISSING=ON, $
```

Field DT1 supports missing values. Consider the following request:

```
TABLE FILE DATETIM2
PRINT ID DT1
END
```

The resulting report output shows that in the instance with ID=3, the field DT1 has a missing value:

```
ID  DT1
--  ---
1   2000/01/01 02:57:25
2   1999/12/31 00:00:00
3   .
```

The following request selects values of DT1 that are greater than 2000/01/01 00:00:00 and are not missing:

```
TABLE FILE DATETIM2
PRINT ID DT1
WHERE DT1 NE MISSING AND DT1 GT DT(2000/01/01 00:00:00);
END
```

The missing value is not included in the report output:

```
ID  DT1
--  ---
1   2000/01/01 02:57:25
```

Example Assigning a Different Usage Format to a Date-Time Column

Consider the following request using the VIDEOTR2 data source:

```
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE AND COMPUTE
    DT2/HYYMDH = TRANSDATE;
    T1/HHIS = TRANSDATE;
WHERE DATE EQ 2000
END
```

The output is:

CUSTID	TRANSDATE	DT2	T1
-----	-----	---	--
1118	2000/06/26 05:45	2000/06/26 05	05:45:00
1237	2000/02/05 03:30	2000/02/05 03	03:30:00

Date-Time Functions

The following functions allow you to manipulate date-time values:

Function Name	Description
HCNVRT	Converts date-time values to alphanumeric format for use with operators such as EDIT, CONTAINS, and LIKE.
HINPUT	Converts an alphanumeric string to a date-time value.
HADD	Increments date-time values by a specified number of units.

Function Name	Description
HDIFF	Returns the number of units of a specific date-time component between two date-time values.
HNAME	Extracts specified components of a date-time value and converts them to alphanumeric format.
HPART	Extracts a component of a date-time value in numeric format.
HSETPT	Inserts the numeric value of a specified component in a date-time field.
HMIDNT	Changes the time portion of a date-time field to midnight.
HDATE	Extracts the date components from a date-time field and converts them to a date field.
HDTTM	Converts a date field to a date-time field with the time set to midnight.
HTIME	Extracts all of the time components from a date-time field and converts them to a number of milliseconds or microseconds in numeric format.
HGETC	Returns the current date and time in date-time format.

Note:

- In those arguments that give you a choice of 8 or 10, use 8 for processing values without microseconds, 10 when the field value includes microseconds.
- The last argument is always a USAGE format that indicates the data type returned by the function. The type may be A (alpha), I (integer), D (double precision), DATE (smart date), or H (date-time).

Reference Component Names and Values for Use With Date-Time Functions

The following component names and values are supported as arguments to those date-time functions that require you to specify a component name as an argument:

Component Name	Valid Values
<code>year</code>	0001-9999
<code>quarter</code>	1-4
<code>month</code>	1-12
<code>day-of-year</code>	1-366
<code>day</code> or <code>day-of-month</code>	1-31 (The two names for the component are equivalent.)
<code>week</code>	1-53
<code>weekday</code>	1-7 (Sunday-Saturday)

Component Name	Valid Values
hour	0-23
minute	0-59
second	0-59
millisecond	0-999
microsecond	0-999999

Reference Notes Regarding ISO Standard Date-Time Representations

International Standard ISO 8601 describes the standards for numeric representations of date and time. Some of the relevant standards and notes about their implementation follow:

- The international standard date notation is YYYY-MM-DD. In this implementation, you can control the date format used to enter date-time values with the DATEFORMAT parameter. For details, see [How to Specify the Order of Date Components in Formatted Input Values](#).
- The international standard for the first day of a week is Monday. You can use the WEEKFIRST parameter to control the day used as the first day of the week by the date-time functions.

- The standard specifies that week 1 of a year is the first week of the year that has a Thursday. Combined with the standard of Monday as day 1, this rule ensures that week 1 has at least four of its days in the specified year. The following rules represent an extension to the standard in this implementation:
 - Whatever day you choose for your WEEKFIRST setting, the date-time functions define week 1 as the first week with at least four days in the specified year.
 - With these rules, it is possible for the first few days of January to fall in the week prior to week 1. The international standard considers these dates to be in week 53 of the previous year. However, the date-time functions return zero for the week component when it falls in the week prior to week 1.
- The international standard notation for the time of day is hh:mm:ss using the 24-hour system. However, the date-time data type and date-time functions allow you to use the 12-hour system.

HCNVRT: Converting a Date-Time Field to Alphanumeric Format

Use the following syntax in an expression to convert a date-time field to alphanumeric format for use with operators such as EDIT, CONTAINS, and LIKE.

```
HCNVRT (dtfield, '(Hfmt)', rlength, 'Ann')
```

where:

dtfield

Is the date-time value to convert. You can supply the name of a date-time field, a date-time constant, or an expression that returns a date-time value.

Hfmt

Is the USAGE format of the date-time field being converted, enclosed in parentheses and single quotation marks.

rlength

Is the length of the alphanumeric field returned. You can supply the actual value, the name of a numeric field that contains the value, or an expression that returns the value. If *rlength* is smaller than the number of characters needed to display the alphanumeric field, an all-blank field is returned.

Ann

Is the USAGE format of the returned alphanumeric value, enclosed in single quotation marks.

Example Converting a Date-Time Field to Alphanumeric Format

The following request converts the TRANSDATE field to alphanumeric format:

```
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE AS 'DATE-TIME' AND COMPUTE
ALPHA_DATE_TIME1/A20 = HCNVRT (TRANSDATE,'(H17)', 17, 'A20');
ALPHA_DATE_TIME2/A20 = HCNVRT (TRANSDATE,'(HYYMDS)', 20, 'A20');
WHERE DATE EQ 2000
END
```

The output is:

CUSTID	DATE-TIME	ALPHA_DATE_TIME1	ALPHA_DATE_TIME2
-----	-----	-----	-----
1118	2000/06/26 05:45	20000626054500000	2000/06/26 05:45:00
1237	2000/02/05 03:30	20000205033000000	2000/02/05 03:30:00

HINPUT: Converting an Alphanumeric String to a Date-Time Value

Use the following syntax in an expression to convert an alphanumeric string to a date-time value.

```
HINPUT (inputlength, 'inputstring', {8|10}, 'Hfmt')
```

where:

inputlength

Is the length of the alphanumeric string to convert. You can supply the actual value, the name of a numeric field that contains the value, or an expression that returns the value.

inputstring

Is the alphanumeric string to convert. You can supply the actual string enclosed in single quotation marks, the name of an alphanumeric field, or an expression that returns an alphanumeric value. The alphanumeric string can consist of any valid date-time input value as described in [Describing Date-Time Values](#).

8 | 10

Is the length of the returned date-time value. Use 8 for time values down to milliseconds, 10 for time values down to microseconds.

Hfmt

Is the USAGE format of the returned date-time value, enclosed in single quotation marks.

Example Converting an Alphanumeric String to a Date-Time Value

The following request converts the TRANSDATE field to alphanumeric format (using the HCNVRT function) and then uses the HINPUT routine to convert the alphanumeric string to a date-time value:

```
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE AS 'DATE-TIME' AND COMPUTE
ALPHA_DATE_TIME/A20 = HCNVRT (TRANSDATE,'(H17)', 17, 'A20');
DT_FROM_ALPHA/HYMDS = HINPUT(14, ALPHA_DATE_TIME, 8, 'HYMDS');
WHERE DATE EQ 2000
END
```

The output is:

CUSTID	DATE-TIME	ALPHA_DATE_TIME1	ALPHA_DATE_TIME2
-----	-----	-----	-----
1118	2000/06/26 05:45	20000626054500000	2000/06/26 05:45:00
1237	2000/02/05 03:30	20000205033000000	2000/02/05 03:30:00

HADD: Incrementing a Date-Time Field

Use the following syntax in an expression to increment a date-time field by a given number of units, for example, 1 year, 3 months, or -15 seconds.

```
HADD (dtfield, 'component', increment, {8 | 10}, 'Hformat')
```

where:

dtfield

Is the date-time value to increment. You can supply the name of a date-time field, a date-time constant, or an expression that returns a date-time value.

component

Is the name of the component to be incremented, enclosed in single quotation marks. See [Component Names and Values for Use With Date-Time Functions](#) for a list of supported components.

increment

Is the number of units by which to increment the specified component. You can supply the actual value, the name of a numeric field that contains the value, or an expression that returns the value.

8 | 10

Is the length of the returned date-time value. Use 8 for time values down to milliseconds, 10 for time values down to microseconds.

Hformat

Is the USAGE format of the returned date-time value, enclosed in single quotation marks.

Example Incrementing the Month Component of a Date-Time Field

The following request adds two months to the TRANSDATE field:

```
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE AS 'DATE-TIME' AND COMPUTE
ADD_MONTH/HYYMDS = HADD (TRANSDATE, 'MONTH', 2, 8, 'HYYMDS');
WHERE DATE EQ 2000
END
```

The output is:

CUSTID	DATE-TIME	ADD_MONTH
-----	-----	-----
1118	2000/06/26 05:45	2000/08/26 05:45:00
1237	2000/02/05 03:30	2000/04/05 03:30:00

If necessary, the day is adjusted to be valid for the resulting month.

HDIFF: Finding the Number of Units Between Two Date-Time Values

Use the following syntax in an expression to find the number of boundaries of a given type crossed in going from date 2 to date 1.

```
HDIFF (dtfield1, dtfield2, 'component', 'Dformat')
```

where:

dtfield1

Is the ending date-time value. You can supply the name of a date-time field, a date-time constant, or an expression that returns a date-time value.

dtfield2

Is the starting date-time value. You can supply the name of a date-time field, a date-time constant, or an expression that returns a date-time value.

component

Is the name of the component to be used in the calculation, enclosed in single quotation marks. See [Component Names and Values for Use With Date-Time Functions](#) for a list of supported components. If the unit is weeks, the WEEKFIRST setting is used in the calculation.

Dformat

Is the USAGE format of the resulting number of units, enclosed in single quotation marks. The format type must be D.

Example Finding the Number of Days Between Two Date-Time Fields

The following request finds the number of days between the ADD_MONTH and TRANSDATE fields:

```
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE AS 'DATE-TIME' AND COMPUTE
ADD_MONTH/HYYMDS = HADD (TRANSDATE, 'MONTH', 2, 8, 'HYYMDS');
DIFF_DAYS/D12.2 = HDIFF(ADD_MONTH, TRANSDATE, 'DAY', 'D12.2');
WHERE DATE EQ 2000
END
```

The output is:

CUSTID	DATE-TIME	ADD_MONTH	DIFF_DAYS
-----	-----	-----	-----
1118	2000/06/26 05:45	2000/08/26 05:45:00	61.00
1237	2000/02/05 03:30	2000/04/05 03:30:00	60.00

HNAME: Extracting a Date-Time Component in Alphanumeric Format

Use the following syntax in an expression to extract a specified component from a date-time field and return it in alphanumeric format.

```
HNAME (dtfield, component, Aformat)
```

where:

dtfield

Is the date-time value. You can supply the name of a date-time field, a date-time constant, or an expression that returns a date-time value.

component

Is the name of the component to be extracted, enclosed in single quotation marks. See [Component Names and Values for Use With Date-Time Functions](#) for a list of supported components.

Aformat

Is the alphanumeric USAGE format of the returned component, enclosed in single quotation marks. All other components are converted to strings of digits only. The year is always four digits, and the hour assumes the 24-hour system.

Example Extracting the Day Component in Alphanumeric Format From a Date-Time Field

The following request extracts the day in alphanumeric format from the TRANSDATE field:

```
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE AS 'DATE-TIME' AND COMPUTE
DAY_COMPONENT/A2 = HNAME(TRANSDATE, 'DAY', 'A2');
WHERE DATE EQ 2000
END
```

The output is:

CUSTID	DATE-TIME	DAY_COMPONENT
-----	-----	-----
1118	2000/06/26 05:45	26
1237	2000/02/05 03:30	05

Example Extracting the Week Component With Different WEEKFIRST Settings

The following request extracts the week in alphanumeric format from the TRANSDATE field. Changing the WEEKFIRST setting changes the value of the extracted component:

```
SET WEEKFIRST = 7
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE AS 'DATE-TIME' AND COMPUTE
WEEK_COMPONENT/A10 = HNAME(TRANSDATE, 'WEEK', 'A10');
WHERE DATE EQ 2000
END
```

The output is:

CUSTID	DATE-TIME	WEEK_COMPONENT
-----	-----	-----
1118	2000/06/26 05:45	26
1237	2000/02/05 03:30	06

Running the same request setting WEEKFIRST to 3 produces the following output (see [How to Specify the First Day of the Week](#)):

CUSTID	DATE-TIME	WEEK_COMPONENT
-----	-----	-----
1118	2000/06/26 05:45	25
1237	2000/02/05 03:30	05

HPART: Extracting a Date-Time Component in Numeric Format

Use the following syntax in an expression to extract a specified component from a date-time field and return it in numeric format.

```
HPART (dtfield, 'component', 'Iformat')
```

where:

dtfield

Is the date-time value. You can supply the name of a date-time field, a date-time constant, or an expression that returns a date-time value.

component

Is the name of the component to be extracted, enclosed in single quotation marks. See [Component Names and Values for Use With Date-Time Functions](#) for a list of supported components.

Iformat

Is the integer USAGE format of the returned component, enclosed in single quotation marks. The year is always four digits, and the hour assumes the 24-hour system.

Example Extracting the Day Component in Numeric Format From a Date-Time Field

The following request extracts the day in integer format from the TRANSDATE field:

```
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE AS 'DATE-TIME' AND COMPUTE
DAY_COMPONENT/I2 = HPART(TRANSDATE, 'DAY', 'I2');
WHERE DATE EQ 2000
END
```

The output is:

CUSTID	DATE-TIME	DAY_COMPONENT
-----	-----	-----
1118	2000/06/26 05:45	26
1237	2000/02/05 03:30	5

HSETPT: Inserting a Component Into a Date-Time Field

Use the following syntax in an expression to insert the numeric value of a specified component into a date-time field.

```
HSETPT (dtfield, 'component', value, {8|10}, 'Hformat')
```

where:

dtfield

Is the date-time value. You can supply the name of a date-time field, a date-time constant, or an expression that returns a date-time value.

component

Is the name of the component to be inserted, enclosed in single quotation marks. See [Component Names and Values for Use With Date-Time Functions](#) for a list of supported components.

value

Is the numeric value to use for the requested component. You can supply the actual value, the name of a numeric field that contains the value, or an expression that returns the value.

8 | 10

Is the length of the returned date-time value. Use 8 for time values down to milliseconds, 10 for time values down to microseconds.

Hformat

Is the USAGE format of the returned date-time value, enclosed in single quotation marks.

Example Inserting the Day Component Into a Date-Time Field

The following request inserts the day into the ADD_MONTH field:

```
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE AS 'DATE-TIME' AND COMPUTE
ADD_MONTH/HYYMDS = HADD (TRANSDATE, 'MONTH', 2, 8, 'HYYMDS');
INSERT_DAY/HYYMDS = HSETPT(ADD_MONTH, 'DAY', 28, 8, 'HYYMDS');
WHERE DATE EQ 2000
END
```

The output is:

CUSTID	DATE-TIME	ADD_MONTH	INSERT_DAY
-----	-----	-----	-----
1118	2000/06/26 05:45	2000/08/26 05:45:00	2000/08/28 05:45:00
1237	2000/02/05 03:30	2000/04/05 03:30:00	2000/04/28 03:30:00

HMIDNT: Setting the Time Portion of a Date-Time Field to Midnight

Use the following syntax in an expression to change the time portion of a date-time field to midnight (all zeroes). This function can be used for testing date-time fields for a given date.

```
HMIDNT (dtfield, {8|10}, 'Hformat')
```

where:

dtfield

Is date-time value. You can supply the name of a date-time field, a date-time constant, or an expression that returns a date-time value.

8 | 10

Is the length of the returned date-time value. Use 8 for time values down to milliseconds, 10 for time values down to microseconds.

Hformat

Is the USAGE format of the returned date-time value, enclosed in single quotation marks.

Example Setting the Time to Midnight

The following request sets the time portion of the TRANSDATE field to midnight in both the 24- and 12-hour systems:

```
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE AS 'DATE-TIME' AND COMPUTE
TRANSDATE_MID_24/HYYMDS = HMIDNT(TRANSDATE, 8, 'HYYMDS');
TRANSDATE_MID_12/HYYMSA = HMIDNT(TRANSDATE, 8, 'HYYMSA');
WHERE DATE EQ 2000
END
```

The output is:

CUSTID	DATE-TIME	TRANSDATE_MID_24	TRANSDATE_MID_12
-----	-----	-----	-----
1118	2000/06/26 05:45	2000/06/26 00:00:00	2000/06/26 12:00:00AM
1237	2000/02/05 03:30	2000/02/05 00:00:00	2000/02/05 12:00:00AM

HDATE: Converting the Date Portion of a Date-Time Field to a Date Format

Use the following syntax in an expression to extract the date portion of a date-time field and convert it to a date format (number of days since the base date 1900/12/31).

```
HDATE (dtfield, 'dateformat')
```

where:

dtfield

Is the date-time value. You can supply the name of a date-time field, a date-time constant, or an expression that returns a date-time value.

dateformat

Is the USAGE format of the returned date field (for example, YMD), enclosed in single quotation marks.

Example Converting the Date Portion of the TRANSDATE Field to a Date Format

The following request converts the date portion of the TRANSDATE field to date format YYMD:

```
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE AS 'DATE-TIME' AND COMPUTE
TRANSDATE_DATE/YYMD = HDATE(TRANSDATE, 'YYMD');
WHERE DATE EQ 2000
END
```

The output is:

CUSTID	DATE-TIME	TRANSDATE_DATE
-----	-----	-----
1118	2000/06/26 05:45	2000/06/26
1237	2000/02/05 03:30	2000/02/05

HDTTM: Converting a Date field to a Date-Time Field

Use the following syntax in an expression to convert a date field to a date-time field. The time portion is set to midnight.

```
HDTTM (datefield, {8|10}, Hformat)
```

where:

datefield

Is the date value to be converted. You can supply the name of a date field, a date constant, or an expression that returns a date value.

8 | 10

Is the length of the returned date-time value. Use 8 for time values down to milliseconds, 10 for time values down to microseconds.

Hformat

Is the USAGE format of the returned date-time value.

Example Converting a Date Field to a Date-Time Field

The following request converts the date field `TRANSDATE_DATE` to a date-time field:

```
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE AS 'DATE-TIME' AND COMPUTE
TRANSDATE_DATE/YYMD = HDATE(TRANSDATE, 'YYMD');
DT2/HYYMDIA = HDTTM(TRANSDATE_DATE, 8, 'HYYMDIA');
WHERE DATE EQ 2000
END
```

The output is:

CUSTID	DATE-TIME	TRANSDATE_DATE	DT2
-----	-----	-----	---
1118	2000/06/26 05:45	2000/06/26	2000/06/26 12:00AM
1237	2000/02/05 03:30	2000/02/05	2000/02/05 12:00AM

HTIME: Converting the Time Portion of a Date-Time Field to a Number

Use the following syntax in an expression to convert the time portion of a date-time field to a numeric number of milliseconds (if the first argument is 8) or microseconds (if the first argument is 10). For microseconds, the input date-time field must be a 10-byte field.

```
HTIME ({8|10}, dtfield, 'Dformat')
```

where:

8 | 10

Is the length of the input date-time value. Use 8 for time values down to milliseconds, 10 for input time values down to microseconds.

dtfield

Is the date-time value to use for extracting the time. You can supply the name of a date-time field, a date-time constant, or an expression that returns a date-time value.

Dformat

Is the USAGE format of the returned number of milliseconds or microseconds, enclosed in single quotation marks.

Example Converting the Time Portion of a Date-Time Field to a Number

The following request converts time portion of the TRANSDATE field to a number of milliseconds:

```
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE AS 'DATE-TIME' AND COMPUTE
MILLISEC/D12.2 = HTIME(8, TRANSDATE, 'D12.2');
WHERE DATE EQ 2000
END
```

The output is:

CUSTID	DATE-TIME	MILLISEC
-----	-----	-----
1118	2000/06/26 05:45	20,700,000.00
1237	2000/02/05 03:30	12,600,000.00

HGETC: Storing the Current Date and Time in a Date-Time Field

Use the following syntax in an expression store the current date and time in a date-time field. If millisecond or microsecond values are not available in your operating environment, the value returned for these components is zero.

```
HGETC ({8|10}, 'Hformat')
```

where:

8 | 10

Is the length of the returned date-time value. Use 8 for time values down to milliseconds, 10 for input time values down to microseconds.

Hformat

Is the USAGE format of the returned date-time value, enclosed in single quotation marks.

Example Storing the Current Date and Time in a Date-Time Field

The following request stores the current date and time in field DT2:

```
TABLE FILE VIDEOTR2
PRINT CUSTID TRANSDATE AS 'DATE-TIME' AND COMPUTE
DT2/HYYMDm = HGETC(10, 'HYYMDm');
WHERE DATE EQ 2000
END
```

The output is:

CUSTID	DATE-TIME	DT2
-----	-----	---
1118	2000/06/26 05:45	2000/10/03 15:34:24.000000
1237	2000/02/05 03:30	2000/10/03 15:34:24.000000

NF755: Using FILEDEF for Creating Extract Files

By default in VM/CMS, extract files are written to the VM minidisk specified by the SET TEMP command. If you do not issue the SET TEMP command, extract files are written to the minidisk with the largest amount of unused space to which you have write access. The name of an extract file is the AS name specified in the command that creates it or, if no AS name is specified, a default name (HOLD, SAVE, or SAVB). The file type is assigned based on the extract file format.

This feature enables you to use a FILEDEF command to assign a file name, file type, and file mode for an extract file. In prior releases, FILEDEF was supported for creating SAVE and SAVB files, but not for creating HOLD files.

In the case of a HOLD file, the Master File is not affected by the FILEDEF command. The Master File is written to the minidisk specified by the SET TEMP command, and its name is taken from the AS name in the HOLD command. If the HOLD command does not contain an AS phrase, the Master File name is HOLD.

The HOLD, SAVE, or SAVB command can be issued within a request or after a request executes.

Note: The FILEDEF command is not supported on OS/390 or MVS. As in prior releases, you can use the DYNAM ALLOCATE or TSO ALLOCATE command to dynamically allocate extract files.

Syntax How to Use a FILEDEF Command for Creating an Extract File

Issue the following command before creating the extract file:

```
CMS FILEDEF ddname DISK filename filetype filemode
```

where:

ddname

Is the AS name from the HOLD, SAVE, or SAVB command. If the command did not specify an AS name, the ddname is HOLD, SAVE, or SAVB.

filename

Is the file name for the extract file.

filetype

Is the file type for the extract file.

filemode

Is the file mode for the extract file. You must have write access to this minidisk. If you do not have write access, the following error message is returned:

```
(FOC350) ERROR WRITING OUTPUT FILE: filename
```

Note:

- If a FOCSORT file is created, it is written to the minidisk specified by the SET TEMP command.
- The FILEDEF command must be in effect any time you use FOCUS to access the file.
- Do not specify DCB parameters for a HOLD file; if you do, they will be ignored.

- The FILEDEF command is not supported for creating extract files in FOCUS format or other DBMS formats.
- The FILEDEF command is supported for MATCH FILE requests.

Example Using FILEDEF to Create a HOLD File

In the following examples, SET TEMP = T. The request is:

```
TABLE FILE EMPLOYEE
PRINT CURR_SAL BY LAST_NAME BY FIRST_NAME
ON TABLE HOLD AS CURRSAL
END
```

Running this request with no FILEDEF command creates the following files:

```
CURRSAL  MASTER    T1
CURRSAL  FOCTEMP   T1
```

Issue the following FILEDEF command:

```
CMS FILEDEF CURRSAL DISK SALLIST DATA A
```

Now, running the same request creates the following files:

```
CURRSAL  MASTER    T1
SALLIST  DATA      A1
```

Note that the file name, file type, and destination minidisk for the extract file are taken from the FILEDEF command. The file name and destination minidisk for the Master File are not.

NF759: Increased Number of Display Fields

The maximum number of display fields allowed in a request has been increased from 256 to approximately 495. This number includes all named fields, whether printed or not, such as data source fields, temporary fields (virtual fields and calculated values), certain internal fields (for example, TABPAGENO) and fields used in headings and footings. The increased field limit is the maximum number of fields allowed when each field has the smallest length possible (A4 ACTUAL). Longer field lengths reduce the total number of printable fields.

Reference Error Messages for Number of Display Fields

(FOC005) THE NUMBER OF VERB OBJECTS EXCEEDS THE MAXIMUM

Up to 495 fields may be used in a single report request. This total does not include sort fields.

(FOC098) TOTAL LENGTH OF VERB OBJECTS EXCEED 3956 CHARACTERS

The length of all verb objects was greater than 3956. Adjust the lengths or quantity of fields and reissue the TABLE request.

Reference Usage Notes for Number of Display Fields

- Out of a 4K there exists a 3956 byte data area. (The data area is where fields are stored for report creation.)
- Every field in this data area is rounded up to a full word boundary.
- Every field gets a four-byte counter field associated with it and the four-byte counter field affects the total number of bytes in this data area.

NF759: Increased Number of Display Fields

- Field Prefixes, and formatting options may also affect the available data area.

NF761: Comma Suppress Edit Format Option

The comma suppress edit format option allows you to suppress the display of commas. This gives you the ability to display numeric and monetary data without commas and gives you an additional display option when using COMPUTE/DEFINE.

Syntax How to Suppress Commas

The comma suppress edit option is invoked by including a lower case 'c' after numeric format options M and N (floating and non-floating dollar sign) and data format D (floating-point double-precision).

Format	Data	Display
D6c	41376	41376
D7Mc	6148	\$6148
D7Nc	6148	\$ 6148

Reference Error Messages for Comma Suppress Option

Using the comma suppress edit option with alphanumeric data types causes the following error message to be displayed:

(FOC207) ERROR IN THE FORMAT DEFINITION OF FIELD

Reference Considerations for Comma Suppress Option

This feature may only be used with numeric format options that automatically invoke comma inclusion option C.

Using this option with other numeric data types has no effect.

NF762: Percent Edit Format Option

FOCUS provides a format option that enables you to display a percent sign along with numeric data. This allows you to display data as percentages after calculations using COMPUTE/DEFINE.

Syntax How to Display Percent Signs

The percent edit option is invoked by including a '%' after any numeric format option.

Format	Data	Display
I2%	21	21%
D7%	6148	6,148%
F3.2%	48	48.00%

Reference Error Messages for Percent Display Option

Using the percent edit format option with either alphanumeric data types, format options M and N, or date formats results in the following error message being displayed:

(FOC207) ERROR IN THE FORMAT DEFINITION OF FIELD

Reference Special Considerations for Percent Display Option

This feature may only be used with numeric data.

NF762: Percent Edit Format Option

This feature does not perform calculations intended to derive a percentage of data. It is only a format option that allows numeric data to be displayed as a percentage.

The percent sign may only be displayed on the right hand side of the data.

NF766: DEFINE Functions

A DEFINE function is a named group of calculations that use any number of input values and produce a return value. These functions are not tied to a specific Master File or request and therefore can be reused in different contexts throughout your FOCUS session.

Using DEFINE Functions

A DEFINE function can be called in the same situations that are valid for user-written subroutines. Data types (numeric or alphanumeric) must match between the arguments defined and the arguments used. Shorter alphanumeric arguments are padded with blanks while longer alphanumeric arguments are truncated.

All calculations within the function are done in double precision. As with other FOCUS calculations, format conversions occur only across equal signs in the assignments that define temporary fields.

Before calling a DEFINE function, you must issue the commands that define the function at the FOCUS prompt or in a stored procedure.

Syntax How To Define a Function

```
DEFINE FUNCTION name (parameter1/format1,..., parametern/formatn)
[tempvariablea/formata = expressiona;]
.
.
.
[tempvariablex/formatx = expressionx;]
name/format = [result_expression];
END
```

where:

name

Is the name of the function. This must be the last field calculated in the function and is used to return the value of the function to the calling procedure.

format

Is the format of the value the function returns.

parameter1/format1...parametern/formatn

Are the parameter names and their formats.

If a parameter is alphanumeric, the calling argument must be alphanumeric. Shorter calling arguments are padded on the right with blanks, and longer arguments are truncated.

If a parameter is numeric, the calling argument must also be numeric. To prevent unexpected results, you must be consistent in your use of data types.

tempvariablea/formata...tempvariablex/formatx

Are temporary fields and their formats. Temporary fields hold intermediate values used in the function. You can define as many temporary fields as you need.

expressiona...expressionx

Are the expressions that calculate the temporary field values. The expressions can use parameters, constants, and other temporary fields defined in the same function.

result_expression

Is the expression that calculates the value returned by the function. The expression can use parameters, constants, and temporary fields defined in the same function.

All names defined in the body of the function are local to the function. The last field defined before the END command in the function definition must have the same name as the function and represents the return value for the function.

Example Defining a Function

```
DEFINE FUNCTION SUBTRACT (VAL1/D8, VAL2/D8)
SUBTRACT/D8.2 = VAL1 - VAL2;
END
```

```
TABLE FILE MOVIES
PRINT TITLE LISTPR IN 35 WHOLESALEPR AND COMPUTE
PROFIT/D8.2 = SUBTRACT(LISTPR,WHOLESALEPR);
BY CATEGORY
WHERE CATEGORY EQ 'MYSTERY' OR 'ACTION'
END
```

SUBTRACT is the name of the function. It uses local parameters VAL1 and VAL2.

The output is:

CATEGORY	TITLE	LISTPR	WHOLESALEPR	PROFIT
-----	-----	-----	-----	-----
ACTION	JAWS	19.95	10.99	8.96
	ROBOCOP	19.98	11.50	8.48
	TOTAL RECALL	19.99	11.99	8.00
	TOP GUN	14.95	9.99	4.96
	RAMBO III	19.95	10.99	8.96
MYSTERY	REAR WINDOW	19.98	9.00	10.98
	VERTIGO	19.98	9.00	10.98
	FATAL ATTRACTION	29.98	15.99	13.99
	NORTH BY NORTHWEST	19.98	9.00	10.98
	DEAD RINGERS	25.99	15.99	10.00
	MORNING AFTER, THE	19.95	9.99	9.96
	PSYCHO	19.98	9.00	10.98
	BIRDS, THE	19.98	9.00	10.98
	SEA OF LOVE	59.99	30.00	29.99

Syntax How to Query DEFINE Functions

You can display a list of all defined functions and their parameters by issuing:

```
? FUNCTION
```

A screen similar to the following is displayed:

```
FUNCTIONS CURRENTLY ACTIVE
```

Name	Format	Parameter	Format
-----	-----	-----	-----
SUBTRACT	D8.2	VAL1	D8
		VAL2	D8

If you issue the ? FUNCTION command with no functions defined, the following is displayed:

```
NO FUNCTIONS CURRENTLY IN EFFECT
```

Syntax **How to Clear DEFINE Functions**

You can clear functions by issuing:

```
DEFINE FUNCTION {name | *} CLEAR
```

where:

name

Is the function name to clear.

*

Clears all active functions.

Reference **DEFINE Function Limits and Restrictions**

- The number of functions you can define and use in a session is virtually unlimited.
- DEFINE functions are not cleared by issuing a JOIN, or any other FOCUS command, with the exception of DEFINE FUNCTION CLEAR.
- Function names are limited to eight characters. There is no limit on the number of parameters.
- Parameter names are limited to twelve characters.
- DEFINE functions can use other DEFINE functions but cannot be used recursively.

- If you overwrite or clear a DEFINE function, a subsequent attempt to use a temporary field that refers to that function will generate the following message:

(FOC1956) **DEFINE FUNCTION %1 used after CLEAR or reDEFINE**

DEFINE FUNCTION dfname was invoked, but it no longer exists. A "DEFINE FUNCTION dfname" command was processed subsequently (with or without CLEAR), thereby invalidating any references to the the original version of dfname.

Reference DEFINE FUNCTION Error Messages

(FOC1940) **DEFINE FUNCTION name not 1-8 characters: %1**

The name given for a DEFINE FUNCTION (the character string following "DEFINE FUNCTION") contains more than eight characters or is null.

(FOC1941) **DEFINE FUNCTION %1 CLEAR--illegal delimiter**

In a "DEFINE FUNCTION dfname CLEAR" command, the character string dfname contains a forward slash, an open or close parenthesis, or a comma; this is not supported.

(FOC1942) **DEFINE FUNCTION not found: %1**

In a "DEFINE FUNCTION dfname CLEAR" command, the syntax is proper but dfname does not exist, so it cannot be CLEARED.

(FOC1943) **DEFINE FUNCTION needs close paren to delimit params: %1**

A DEFINE FUNCTION definition must contain a list of parameters delimited by a close parenthesis. The DEFINE FUNCTION parser encountered END or a similar termination without finding a close parenthesis.

- (FOC1944) **No open paren after DEFINE FUNCTION format: %1**
A format may be specified for a DEFINE FUNCTION immediately after the DEFINE FUNCTION name (and a forward slash) and before the open parenthesis enclosing the parameter list. The forward slash is coded but the next delimiter is not an open parenthesis.
- (FOC1945) **DEFINE FUNCTION format not 1-8 characters: %1**
A format may be specified for a DEFINE FUNCTION immediately after the DEFINE FUNCTION name (and a forward slash) and before the open parenthesis enclosing the parameter list. The length of the format specification must be from one to eight characters.
- (FOC1946) **Name of DEFINE FUNCTION not delimited by "/" or "(": %1**
The delimiter for the DEFINE FUNCTION name must be a forward slash (if a format specification follows) or an open parenthesis (if there is no format specification). The actual delimiter is neither of these.
- (FOC1947) **DEFINE FUNCTION parameter name not delimited by "/": %1**
A format specification must follow each parameter for a DEFINE FUNCTION, and the delimiter that separates the name from the format specification must be a forward slash. The actual delimiter is not a forward slash.
- (FOC1948) **DEFINE FUNCTION parameter name not 1-12 characters: %1**
The name of each parameter for a DEFINE FUNCTION must contain from one to twelve characters. Either the parameter name shown is null or it contains more than twelve characters.

(FOC1949) `DEFINE FUNCTION parameter format not delimited by ", " or "": %1`

A format specification must follow each parameter for a DEFINE FUNCTION, and the delimiter that marks the end of the specification must be a comma (if there are additional parameters) or a close parenthesis (if this is the last parameter).

(FOC1950) `DEFINE FUNCTION parameter format not 1-8 characters: %1`

A format specification must follow each parameter for a DEFINE FUNCTION, and it must contain from one to eight characters. Either the actual specification contains more than eight characters or it is null.

(FOC1951) `Invalid DEFINE FUNCTION parameter format: %1`

The format specification given for the parameter shown for a DEFINE FUNCTION is not recognized.

(FOC1952) `DEFINE FUNCTION %1 is void`

At least one computational statement must appear between the parameter list for DEFINE FUNCTION and "END", but the actual DEFINE FUNCTION has no computational statements.

(FOC1953) `DEFINE FUNCTION name %1 not equal to final assignment name %2`

The name immediately following "DEFINE FUNCTION" must match the name on the left-hand side of the final computational statement given for the DEFINE FUNCTION, but it does not match.

- (FOC1954) `DEFINE FUNCTION format %1 not equal to final assignment
format %2`
The (optional) format specified before the parameters for a DEFINE FUNCTION must match the format on the left-hand side of the final computational statement given for the DEFINE FUNCTION, but it does not match.
- (FOC1955) `DEFINE FUNCTION %1 entered recursively`
A DEFINE FUNCTION was invoked, but before returning it was invoked again; this is not supported. Note that the invalid recursive usage may have been indirect: DF1 invokes DF2, which invokes DF3, ... , which invokes DF1.
- (FOC1956) `DEFINE FUNCTION %1 used after CLEAR or reDEFINE`
DEFINE FUNCTION dfname was invoked, but it no longer exists. A "DEFINE FUNCTION dfname" command was processed subsequently (with or without CLEAR), thereby invalidating any references to the original version of dfname.
- (FOC1957) `Warning--DEFINE FUNCTION %1 superseded; could result in
FOC1956`
A successful DEFINE FUNCTION dfname has replaced the prior dfname. Trying to use a DEFINE FILE (or another DEFINE FUNCTION) that refers to the prior version of dfname will result in FOC1956. Such a DEFINE FILE/FUNCTION could be re-issued, which would direct it to use the new version of dfname.
- (FOC1958) `DEFINE FUNCTION %1 takes %2 parameter(s), but # supplied`
DEFINE FUNCTION dfn requires Nexpt input parameters, but Nsupp were supplied. dfn, Nexpt, and Nsupp are displayed within the message text.

NF773: Token Delimited Files

FOCUS can now read single-segment sequential data sources in which fields are separated by any delimiter.

Syntax How to Define Files With Delimiters

Delimiters must be defined in the Master File. The FILE declaration must include the following attribute:

```
SUFFIX=DFIX
```

To use a delimiter that consists of a single non-printable character or of one or more printable characters, the delimiter is defined as a field with the following attributes:

```
FIELDNAME=DELIMITER, ALIAS=delimiter, USAGE=ufmt, ACTUAL=afmt , $
```

To use a delimiter that consists of multiple non-printable characters or a combination of printable and non-printable characters, the delimiter is defined as a group:

```
GROUP=DELIMITER,          ALIAS=                , USAGE=ufmtg, ACTUAL=afmtg , $  
  FIELDNAME=DELIMITER, ALIAS=delimiter1, USAGE=ufmt1, ACTUAL=afmt1 , $  
  .  
  .  
  .  
  FIELDNAME=DELIMITER, ALIAS=delimitern, USAGE=ufmtn, ACTUAL=afmtn , $
```

where:

```
DELIMITER
```

Indicates that the field or group is used as the delimiter in the data source.

delimiter

Identifies a delimiter.

For one or more printable characters, the value consists of the actual characters. The delimiter must be enclosed in single quotation marks if it includes characters used as delimiters in Master File syntax.

For a non-printable character, the value is the decimal equivalent of the EBCDIC or ASCII representation of the character, depending on your operating environment.

ufmt, afmt

Are the USAGE and ACTUAL formats for the delimiter. Possible values are:

Type of delimiter	USAGE	ACTUAL
Printable characters	<i>An</i> where <i>n</i> is the number of characters	<i>An</i> where <i>n</i> is the number of characters
Non-printable character such as Tab	<i>I4</i>	<i>I1</i>
Group (combination of printable and non-printable characters, or multiple non-printable characters)	Sum of the individual USAGE lengths	Sum of the individual ACTUAL lengths

Reference Usage Notes for Token Delimited Files

- If the delimiter is alphanumeric and the delimiter value contains special characters (those used as delimiters in Master File syntax), it must be enclosed in single quotation marks.
- Numeric (decimal) values may be used to represent any character, but are predominantly used for non-printable characters such as Tab. The numeric values may differ between EBCDIC and ASCII platforms.
- A delimiter is needed to separate field values. A pair of delimiters denotes a missing or default field value.
- Trailing delimiters are not necessary except that all fields must be terminated with the delimiter if the file resides in CMS or has fixed length records in MVS.
- Only one delimiter field/group is permitted per Master File.
- Token delimited files cannot be used in joins.

Example Defining Delimiters

The following example shows a one-character alphanumeric delimiter:

```
FIELDNAME=DELIMITER, ALIAS=' ' ,USAGE=A1, ACTUAL=A1 , $
```

The following example shows a two-character alphanumeric delimiter:

```
FIELDNAME=DELIMITER, ALIAS=// ,USAGE=A2, ACTUAL=A2 , $
```

The following example shows how to use the Tab character as a delimiter:

```
FIELDNAME=DELIMITER, ALIAS=05 ,USAGE=I4, ACTUAL=I1 , $
```

The following example shows how to use a blank character described as a numeric delimiter:

```
FIELDNAME=DELIMITER, ALIAS=64 ,USAGE=I4, ACTUAL=I1 , $
```

The following example shows a group delimiter (Tab-slash-Tab combination):

```
GROUP=DELIMITER,      ALIAS=      ,USAGE=A9, ACTUAL=A3      ,$
FIELDNAME=DEL1,        ALIAS=05    ,USAGE=I4, ACTUAL=I1      ,$
FIELDNAME=DEL2,        ALIAS=/      ,USAGE=A1, ACTUAL=A1      ,$
FIELDNAME=DEL3,        ALIAS=05    ,USAGE=I4, ACTUAL=I1      ,$
```

Example Separating Field Values for Missing Data

The following Master File shows the MISSING attribute specified for the CAR field:

```
FILE=DFIXF01      ,SUFFIX=DFIX
SEGNAME=SEG1      ,SEGTYPE=S0
FIELDNAME=COUNTRY      ,ALIAS=F1      ,USAGE=A10 ,ACTUAL=A10      ,$
FIELDNAME=CAR          ,ALIAS=F2      ,USAGE=A16 ,ACTUAL=A16      ,MISSING=ON, $
FIELDNAME=NUMBER      ,ALIAS=F3      ,USAGE=P10 ,ACTUAL=Z10      ,$
FIELDNAME=DELIMITER    ,ALIAS=' ' ,USAGE=A1      ,ACTUAL=A1      ,$
```

In the source file, two consecutive comma delimiters indicate missing values for CAR:

```
GERMANY,VOLKSWAGEN,1111
GERMANY,BMW,
USA,CADILLAC,22222
USA,FORD
USA,,44444
JAPAN
ENGLAND,
FRANCE
```


The output is:

<u>COUNTRY</u>	<u>CAR</u>	<u>NUMBER</u>
GERMANY	VOLKSWAGEN	1111
GERMANY	BMW	0
USA	CADILLAC	22222
USA	FORD	0
USA	.	44444
JAPAN	.	0
ENGLAND		0
FRANCE	.	0

NF777: Two-Gigabyte FOCUS Database Support

The FOCUS database size has been increased to a maximum of two gigabytes per physical data file, overcoming previous FOCUS database size limitations. Through partitioning, one logical FOCUS database can now span up to 500 gigabytes. FOCUS database size was previously limited to 64 gigabytes through the use of LOCATION files.

Note that the discussion in this document applies to any FOCUS file that has extended beyond one-gigabyte but has not reached the two-gigabyte limit.

For information about partitioning FOCUS data sources, see [NF777: Partitioned FOCUS Data Sources](#).

Enabling Two-Gigabyte Support

In order to enable support for two-gigabyte databases, you need to set the value of the FOC2GIGDB parameter to ON in the FOCPARM profile.

Syntax **How to Enable Two-Gigabyte Support**

Issue the following command in the FOCPARM profile:

```
SET FOC2GIGDB = {ON|OFF}
```

where:

ON

Enables support for FOCUS data sources larger than one-gigabyte. Note that an attempt to use FOCUS data sources larger than one-gigabyte in a release prior to FOCUS Version 7.1 can cause database corruption.

OFF

Disables support for FOCUS data sources larger than one-gigabyte. OFF is the default value.

Reference Usage Notes for Two-Gigabyte FOCUS Data Sources

- To sort a FOCUS data source that is larger than one-gigabyte, on MVS you must explicitly allocate ddname FOCSORT to a temporary file with enough space to contain the data; on VM, you must have enough TEMP space available.
- To REBUILD a FOCUS data source that is larger than one-gigabyte, on MVS you must explicitly allocate ddname REBUILD to a temporary file with enough space to contain the data; on VM you must have enough TEMP space available. It is strongly recommended that you REBUILD/REORG to a new file, in sections, to avoid the need to allocate large amounts of space to REBUILD. In the DUMP phase, use selection criteria to dump a section of the database. In the LOAD phase, make sure to *add* each new section after the first. To add to a database in MVS you must issue the LOAD command with the following syntax:

LOAD NOCREATE

- If you create a FOCUS data source that is larger than one gigabyte using HOLD FORMAT FOCUS, on MVS you must explicitly allocate ddnames FOC\$HOLD and FOCSORT to temporary files large enough to hold the data; on VM you must have enough TEMP space available.

NF777: Partitioned FOCUS Data Sources

Through partitioning, one logical FOCUS database can now span up to 500 gigabytes. FOCUS database size was previously limited to 64 gigabytes through the use of LOCATION files.

For information about two-gigabyte support, see [NF777: Two-Gigabyte FOCUS Database Support](#)

Partitioning

FOCUS data sources can now consist of up to 250 physical files of up to two gigabytes each, for a maximum of 500 gigabytes of real storage per logical database. The new horizontal partition is a slice of the entire file structure, meaning that new FOCUS database partitions are not subject to the multiplicative effect of LOCATION-style vertical partitioning. Note, however, that the number of physical files associated with one FOCUS data source is the sum of all of its partitions and LOCATION files. This sum must be less than or equal to 250. New FOCUS data sources can grow in size over time, and can be repartitioned based on the requirements of the application.

Note: You do not have to partition your data source. If you choose not to, your application will automatically support the increased FOCUS database size when you set the FOC2GIGDB parameter to ON.

Intelligent Partitioning

The FOCUS database now supports intelligent partitioning, which means that each horizontal partition contains the complete database structure for specific data values or ranges of values. Intelligent partitioning lets you not only separate the data into up to 250 physical two-gigabyte files, it allows you to create an Access File in which you describe, using WHERE criteria, the actual data values in each partition. When processing a report request, the selection criteria in the request are compared to the WHERE criteria in the Access File to determine which partitions are required for retrieval.

To select applications that can benefit most from partitioning, look for applications that employ USE commands to concatenate data sources or for data that lends itself to separation based on data values or ranges of values, such as data stored by month or by department. Intelligent partitioning functions like an intelligent USE. It looks at the Access File when processing a report request to determine which partitions to read, whereas the USE command reads all of the files on the list. This intelligence decreases I/O and delivers significant performance benefits.

To take advantage of the partitioning feature, you must:

- Edit the Master File and add the ACCESSFILE attribute.
- Create the Access File using a text editor.

Concatenation of multiple partitions is supported for reporting only. You must load or rebuild each physical partition separately.

You can either create a separate Master File for each partition to reference in the load procedure, or you can use the single Master File created for reporting against the partitioned data source, if you:

- Issue an explicit allocation command to link the Master File to each partition in turn.
- Run the load procedure for each partition in turn.

Note: Report requests will automatically read all required partitions without user intervention.

Specifying an Access File in a FOCUS Master File

To take advantage of the partitioning feature, you must edit the Master File and add the ACCESSFILE attribute to identify the name of the Access File.

Syntax How to Specify an Access File for a Partitioned FOCUS Database

```
FILENAME=fname, SUFFIX=FOC, ACCESS[FILE]=accessfile,  
.  
.  
.
```

where:

fname

Is the file name of the partitioned data source.

accessfile

Is the name of the Access File. Note that this can be any valid name.

Example Master File for the VIDEOTR2 Partitioned Database

```
FILENAME=VIDEOTR2,  SUFFIX=FOC,
ACCESS=VIDEOACX,  $
SEGNAME=CUST,      SEGTYPE=S1
  FIELDNAME=CUSTID,      ALIAS=CIN,      FORMAT=A4,      $
  FIELDNAME=LASTNAME,    ALIAS=LN,      FORMAT=A15,     $
  FIELDNAME=FIRSTNAME,   ALIAS=FN,      FORMAT=A10,     $
  FIELDNAME=EXPDATE,     ALIAS=EXDAT,    FORMAT=YMD,     $
  FIELDNAME=PHONE,       ALIAS=TEL,     FORMAT=A10,     $
  FIELDNAME=STREET,      ALIAS=STR,     FORMAT=A20,     $
  FIELDNAME=CITY,        ALIAS=CITY,    FORMAT=A20,     $
  FIELDNAME=STATE,       ALIAS=PROV,    FORMAT=A4,      $
  FIELDNAME=ZIP,         ALIAS=POSTAL_CODE,  FORMAT=A9,      $
SEGNAME=TRANSDAT, SEGTYPE=SH1, PARENT=CUST
  FIELDNAME=TRANSDATE,   ALIAS=OUTDATE,  FORMAT=HYMDI,   $
SEGNAME=SALES,  SEGTYPE=S2,  PARENT=TRANSDAT
  FIELDNAME=TRANSCODE,   ALIAS=TCOD,    FORMAT=I3,      $
  FIELDNAME=QUANTITY,    ALIAS=NO,      FORMAT=I3S,     $
  FIELDNAME=TRANSTOT,    ALIAS=TTOT,    FORMAT=F7.2S,   $
SEGNAME=RENTALS, SEGTYPE=S2,  PARENT=TRANSDAT
  FIELDNAME=MOVIECODE,   ALIAS=MCOD,    FORMAT=A6, INDEX=I, $
  FIELDNAME=COPY,        ALIAS=COPY,    FORMAT=I2,      $
  FIELDNAME=RETURNDATE,  ALIAS=INDATE,  FORMAT=YMD,     $
  FIELDNAME=FEE,         ALIAS=FEE,     FORMAT=F5.2S,   $
DEFINE DATE/I4 = HPART(TRANSDATE, 'YEAR', 'I4');
```

The FOCUS Access File

The Access File provides comprehensive metadata management for all FOCUS data sources. It shields end users from the complex file storage and configuration details used for efficient and transparent access to partitioned and distributed databases.

The Access File describes how to locate, concatenate, join, and select the appropriate physical data files for retrieval requests against one or more FOCUS databases. Access Files are optional in retrieval requests against non-partitioned databases with no location files and play no part in data maintenance requests.

Every request supplies the name of a Master File. The Master File is read and the declarations in it are used to access the data source. If the Master File includes an ACCESSFILE attribute, FOCUS reads the named Access File and uses it to locate the correct data files. Each Master File can point to its own separate Access File, or several Master Files can point to the same Access File. This flexibility makes it possible to create one Access File that manages database access for an entire application. If the Master File does not contain an ACCESSFILE attribute, FOCUS attempts to satisfy the request with the Master File alone.

You can use an Access File to take advantage of the following database features:

- Horizontal and vertical partitioning. A database can consist of several separate files, or horizontal partitions, each of which contains the database records for a specific time period, region, or other element. Segments can also be stored separately from the rest of the data source (LOCATION files or vertical partitions). The Access File describes how to concatenate the separate data files.
- Joins. If joined files are partitioned, the Access File describes how to concatenate the separate data files in the join.

An Access File is *required* to take advantage of intelligent partitioning. Intelligent partitioning places specific data values in each physical partition and uses the Access File to describe the values in each partition. With this information, FOCUS optimizes database access by retrieving only those partitions whose values are consistent with the selection criteria in the request.

Note: On OS/390 the Access File must be a member of a data set concatenated in the allocation for ddname ACCESS. On VM/ESA the Access File must have the file type ACCESS. FOCSQL cannot be used as the file type. The Access File has the same DCB attributes as the Master File (LRECL=80, RECFM=FB, BLKSIZE= multiple of LRECL).

FOCUS Access File Attributes

The Access File can include the following attributes:

Attribute	Synonyms	Description
MASTERNAME	MASTER	A Master File entry.
DATANAME	DATA	The name of the physical file.
WHERE		The WHERE criteria.
LOCATION		A segment location.

Each Access File declaration begins with a MASTERNAME attribute that identifies the Master File to which it applies. By including multiple MASTERNAME declarations, you can use one Access File for multiple Master Files, possibly for an entire application.

Syntax How to Create an Access File

```
MASTERNAME filename1
  DATANAME dataname1 [WHERE test1 ;]
    [LOCATION locationnamea DATANAME datanamea]
    .
    .
    .
  DATANAME dataname2 [WHERE test2 ;]
    [LOCATION locationnameb DATANAME datanameb]
    .
    .
    .
MASTERNAME filename2
  .
  .
  .
```

where:

MASTERNAME

Is the attribute that identifies the Master File name. MASTER is a synonym for MASTERNAME.

filename1, filename2

Are names of Master Files. You can describe unrelated Master Files in one Access File.

DATANAME

Is the attribute that identifies a physical file. DATA is a synonym for DATANAME.

dataname1, dataname2

Are the fully qualified physical file names of physical partition files, in the syntax native to your operating environment.

test

Is a valid WHERE test. The following types of expressions are supported. You can also combine any number of these expressions with the AND operator:

fieldname relational_operator value1 [OR value2 OR value3 ...]

fieldname FROM value1 TO value2 [OR value3 TO value4 ...]

fieldname1 FROM value1 TO value2 [OR fieldname2 FROM value3 TO value4 ...]

where:

fieldname, fieldname1, fieldname2

Are field names in the Master File.

relational_operator

Can be one of the following: EQ, NE, GT, GE, LT, LE.

value1, value2, value3, value4

Are valid values for their corresponding fields.

Note: If the test conditions do not accurately reflect the contents of the files, you may get incorrect results from requests.

LOCATION

Is the attribute that identifies a separately stored segment.

locationnamea, locationnameb

Are the values of the LOCATION attributes from the Master File.

Segment locations must map one-to-one to horizontal partitions.

datanamea, datanameb

Are the fully qualified physical file names of the LOCATION files, in the syntax native to your operating environment.

Example Describing Intelligent Partitions in a FOCUS Access File

The following Access File illustrates how to define intelligent partitions for the VIDEOTR2 database, in which data is grouped by date.

For MVS:

```
MASTERNAME VIDEOTR2
  DATANAME USER1.VIDPART1.FOCUS
    WHERE DATE EQ 1991;

  DATANAME USER1.VIDPART2.FOCUS
    WHERE DATE FROM 1996 TO 1998;

  DATANAME USER1.VIDPART3.FOCUS
    WHERE DATE FROM 1999 TO 2000;
```

For CMS:

```
MASTERNAME VIDEOTR2
  DATANAME 'VIDPART1 FOCUS A'
    WHERE DATE EQ 1991;

  DATANAME 'VIDPART2 FOCUS A'
    WHERE DATE FROM 1996 TO 1998;

  DATANAME 'VIDPART3 FOCUS A'
    WHERE DATE FROM 1999 TO 2000;
```

Example Describing Intelligent Partitions With LOCATION Files

Consider the following version of a SALES Master File. The CUSTDATA segment is stored in a separate LOCATION file named MORECUST:

```
FILENAME=SALES, ACCESSFILE=XYZ,$  
  SEGNAME=SALEDATA  
.  
.  
.  
  SEGNAME=CUSTDATA, LOCATION=MORECUST,$
```

The corresponding Access File (XYZ) describes one partition for 1994 data, and another partition for the 1993 data. Each partition has its corresponding MORECUST LOCATION file:

For MVS:

```
MASTERNAME SALES  
  DATANAME USER1.SALES94.FOCUS  
    WHERE SDATE FROM '19940101' TO '19941231';  
  LOCATION MORECUST  
    DATANAME USER1.MORE1994.FOCUS  
  
  DATANAME USER1.SALES93.FOCUS  
    WHERE SDATE FROM '19930101' TO '19931231';  
  LOCATION MORECUST  
    DATANAME USER1.MORE1993.FOCUS
```

For CMS:

```
MASTERNAME SALES
  DATANAME 'SALES94 FOCUS A'
    WHERE SDATE FROM '19940101' TO '19941231';
  LOCATION MORECUST
    DATANAME 'MORE1994 FOCUS A'

  DATANAME 'SALES93 FOCUS A'
    WHERE SDATE FROM '19930101' TO '19931231';
  LOCATION MORECUST
    DATANAME 'MORE1993 FOCUS A'
```

Example Using a Partitioned Database

The following illustrates how to use a partitioned database.

```
TABLE FILE VIDEOTR2
PRINT LASTNAME FIRSTNAME DATE
WHERE DATE FROM 1996 TO 1997
END
```

The output is:

LASTNAME	FIRSTNAME	DATE
-----	-----	----
HANDLER	EVAN	1996
JOSEPH	JAMES	1997
HARRIS	JESSICA	1997
HARRIS	JESSICA	1996
MCMAHON	JOHN	1996
WU	MARTHA	1997
CHANG	ROBERT	1996

There is nothing in the request or output that signifies that a partitioned database was used. However, only the second partition is retrieved, reducing I/O and enhancing performance.

Describing Joined Files

The Master File can describe cross-references to other Master Files. In simple cases, the Master File alone may be sufficient for describing the cross-reference.

If one of the joined files is horizontally partitioned, only that file needs an Access File to implement the join.

However, when both of the joined files are horizontally partitioned, they can both be described in one Access File or they can each be described in a separate Access File in order to implement the join. Only the host file is allowed to have WHERE criteria in the Access File. If both the host and cross-referenced file have WHERE criteria, a join may produce unexpected results.

Example Joining Two Partitioned Data Sources

Recall that the cross-referenced field in a join must be indexed. If the host file is partitioned, the cross-referenced file must either contain the same number of partitions as the host file or only one partition.

For MVS:

```
MASTERNAME SALES
  DATANAME USER1.NESALES.FOCUS
  DATANAME USER1.MIDSALES.FOCUS
  DATANAME USER1.SOSALES.FOCUS
  DATANAME USER1.WESALES.FOCUS
```

```
MASTERNAME CUSTOMER
  DATANAME USER1.NECUST.FOCUS
  DATANAME USER1.MIDCUST.FOCUS
  DATANAME USER1.SOCUST.FOCUS
  DATANAME USER1.WECUST.FOCUS
```

For CMS:

```
MASTERNAME SALES
  DATANAME 'NESALES FOCUS A'
  DATANAME 'MIDSALES FOCUS A'
  DATANAME 'SOSALES FOCUS A'
  DATANAME 'WESALES FOCUS A'
```

```
MASTERNAME CUSTOMER
  DATANAME 'NECUST FOCUS A'
  DATANAME 'MIDCUST FOCUS A'
  DATANAME 'SOCUST FOCUS A'
  DATANAME 'WECUST FOCUS A'
```


Reference Usage Notes for Partitioned FOCUS Data Sources

- Concatenation of multiple partitions in one request is only valid for reporting. To MODIFY or REBUILD a partitioned database, you must explicitly allocate and MODIFY, Maintain, or REBUILD one partition at a time.
- The order of precedence for allocating data sources is as follows:
 - A USE command in effect has the highest precedence. It overrides an Access File or an explicit allocation for a data source.
 - An Access File overrides an explicit allocation for a data source.
- A DATASET attribute cannot be used in the same Master File as an ACCESSFILE attribute.

Reference Error Messages

(ACC20201) BOTH DATASET AND ACCESS FILE NOT PERMITTED

A Master file cannot specify a DATASET and an Access File at the same time.

(ACC20202) MEMORY ALLOCATION ERROR

Access File Memory Failure.

(ACC20203) ACCESS FILE %1 (MASTER %2) NOT FOUND

The Access File specified in the Master could not be found. Check the spelling and/or the location of the Access File.

(ACC20204) ACCESS FILE SYSTEM ERROR

The Access File system could not execute the Access File.

- (ACC20205) **UNABLE TO OPEN ACCESS FILE %1**
The Access File specified could not be opened. Check the permissions and/or the name of the Access File.
- (ACC20206) **ACCESS FILE %1 HAS MULTIPLE ENTRIES FOR MASTER %2**
No Access File may have two entries for a single master. Remove all duplicate entries from the Access File
- (ACC20207) **NO ENTRY FOUND FOR MASTER %1 IN ACCESS FILE %2**
An Access File specified in the Master must have a corresponding MASTER name. Add a MASTER entry to the Access File, or remove the Access File from the Master.
- (ACC20208) **UNABLE TO PARSE ACCESS FILE**
An error occurred while trying to parse the Access File.
- (ACC20209) **PARSER ERROR: %1**
There is a grammatical and/or syntactical error in the Access File. If nn/ii/ll is shown then look at line nn, column ii, for a length of ll for the problem token.
- (ACC20211) **UNABLE TO PARSE WHERE CLAUSE**
The WHERE clause in the Access File could not be parsed. Check the clause and parse the Master again.
- (ACC20212) **ACCESS FILE LOGICAL NAME LENGTH EXCEEDED : %1**
Logical Names: Master File Name, External Location Names, and External Index Names Logical names may not exceed 8 characters.
- (ACC20215) **ACCESS FILE SYSTEM ERROR FOR FILE : %1**
Check the physical file name in the Access File.

(ACC20216) TOO MANY PARTITIONS. PARTITION %1 FOR MASTER %2 EXCEEDS LIMIT.

There is a limit to the total number of physical partitions that may be used in a request. Delete partitions that are not needed from the Access File.

(ACC20217) ACCESS FILE TOKEN %1 TOO LONG

The Token in the Access File is too long. No Token may be longer than 80 characters.

(ACC20219) PARTITION %2 IS MISSING AN ENTRY FOR LOCATION %1

If a location entry exists for a horizontal partition, it must be specified for all partitions.

(ACC20224) WHERE CLAUSE EXCLUDES ALL AVAILABLE PARTITIONS

The WHERE/IF clause in the current request does not match any of the WHERE clauses specified in the Access File. No partitions can be accessed.

(ACC20225) UNABLE TO LOAD ACCFILE MODULE

The system is unable to find a required library.

(ACC20226) DATASET SPECIFIED FOR MASTER %1 DOES NOT EXIST

The dataset specified in the Master either has not been created or cannot be read. Verify the status of the specified physical file and try the request again.

(ACC20227) PARTITION No. %2 FOR DATABASE %1 DOES NOT EXIST

The partition specified in the Access File for the above Master either has not been created or cannot be read. Verify the status of the physical partition.

(ACC20228) LOCATION %3 IN PARTITION No. %2 FOR DATABASE %1 DOES NOT
EXIST

The physical file specified for the above LOCATION for the specified partition in the given database either does not exist or cannot be read. Verify the status of the file and retry the request.

(ACC20235) INVALID PHYSICAL FILENAME %2 FOR MASTER %1

Only absolute filenames are accepted by the Access File and the DATASET command.

NF778: Dialogue Manager TRUNCATE Function

The Dialogue Manager TRUNCATE function removes trailing blanks from Dialogue Manager ampers variables and adjusts the length accordingly.

Using the Dialogue Manager TRUNCATE Function

The Dialogue Manager TRUNCATE function has only one argument, the string or variable to be truncated. If you attempt to use the Dialogue Manager TRUNCATE function with more than one argument, the following error message is generated:

```
(FOC03665) Error loading external function 'TRUNCATE'
```

This function can only be used in Dialogue Manager commands that support subroutine calls, such as -SET and -IF commands. It cannot be used in -TYPE or -CRTFORM commands or in arguments passed to stored procedures.

Note: A user-written subroutine of the same name can exist without conflict.

Syntax How to Use the TRUNCATE Function

```
-SET &var2 = TRUNCATE(&var1);
```

where:

&var2

Is the Dialogue Manager variable to which the truncated string is returned. The length of this variable is the length of the original string or variable minus the trailing blanks. However, if the original string consisted of only blanks, a single blank, with a length of one is returned.

`&var1`

Is a Dialogue Manager variable or a literal string enclosed in single quotation marks. System variables and statistical variables are allowed as well as user-created local and global variables.

Example Using the Dialogue Manager TRUNCATE Function

The following example shows the result of truncating trailing blanks:

```
-SET &LONG = 'ABC ' ;  
-SET &RESULT = TRUNCATE(&LONG);  
-SET &LL = &LONG.LENGTH;  
-SET &RL = &RESULT.LENGTH;  
-TYPE LONG = &LONG LENGTH = &LL  
-TYPE RESULT = &RESULT LENGTH = &RL
```

The output is:

```
LONG = ABC LENGTH = 06  
RESULT = ABC LENGTH = 03
```

The following example shows the result of truncating a string of all blanks:

```
-SET &LONG = ' ' ;  
-SET &RESULT = TRUNCATE(&LONG);  
-SET &LL = &LONG.LENGTH;  
-SET &RL = &RESULT.LENGTH;  
-TYPE LONG = &LONG LENGTH = &LL  
-TYPE RESULT = &RESULT LENGTH = &RL
```

The output is:

```
LONG = LENGTH = 06  
RESULT = LENGTH = 01
```

The following example uses the TRUNCATE function as an argument for EDIT:

```
-SET &LONG = 'ABC ' ;  
-SET &RESULT = EDIT(TRUNCATE(&LONG)|'Z','9999');  
-SET &LL = &LONG.LENGTH;  
-SET &RL = &RESULT.LENGTH;  
-TYPE LONG = &LONG LENGTH = &LL  
-TYPE RESULT = &RESULT LENGTH = &RL
```

The output is:

```
LONG = ABC LENGTH = 06  
RESULT = ABCZ LENGTH = 04
```

NF779: FOCUS CRTFORM HTML Translation

When the HTML/TP feature of Web390 generates replacement HTML forms for a 3270 screen, it can dynamically account for fields that may or may not be populated with data during execution. HTML/TP can use this technique with turnaround (T.) fields on CRTFORMs because they are enclosed in @ signs. These @-sign markers enable HTML/TP to recognize them and handle them dynamically on a customized HTML form. In contrast, CRTFORM display (D.) fields are not normally enclosed in @ signs.

A new SET parameter, WEBTAB, can be used to instruct FOCUS to enclose CRTFORM display fields in @ signs.

Note: This setting is only for those MODIFY CRTFORM or Dialogue Manager -CRTFORM applications that will be used in conjunction with the HTML/TP feature of Web390. For information about Web390 and the HTML/TP feature, see the *Web390 for OS/390 and MVS Developer's Guide and Installation Manual*.

Syntax How to Add Markers to CRTFORM Display Fields

`SET WEBTAB = {ON|OFF}`

where:

ON

Adds @ signs around CRTFORM display fields. These markers may cause the fields displayed on the CRTFORM to shift slightly to the right. Use this setting only for MODIFY CRTFORM or Dialogue Manager -CRTFORM applications that will be used in conjunction with the HTML/TP feature of Web390.

OFF

Does not place @ signs around CRTFORM display fields. OFF is the default setting.

Syntax How to Query the WEBTAB Parameter Setting

The WEBTAB parameter setting is displayed by ? SET WEBTAB query command.

? SET WEBTAB

NF781: Embedding Text Fields in Headings

You can now embed text fields (FORMAT=TXn) in heading types (heading, footing, subhead, subfoot, and ON TABLE subhead and subfoot) in reports.

Example Embedding a Text Field in a Heading

The following example illustrates how to embed a text field in a heading.

```
TABLE FILE TXTFLD
BY COUNTRY SUBHEAD
"Here is a TX field: <TEXTFLD"
END
```

The heading in the output is:

```
Here is a TX field: The quick brown
                    fox jumps over
                    the lazy dog.
```

The following is the Master File for this example:

```
FILENAME=TXTFLLD,SUFFIX=FOC
SEGNAME=ORIGIN,SEGTYPE=S1
FIELDNAME=COUNTRY, FORMAT=A16, $
FIELDNAME=TEXTFLD, FORMAT=TX16, $
```

As is shown in this example, the text field values display on one or more lines. The output is aligned vertically so that the position of the TX field in the initial line is maintained in the following lines.

The number of characters specified in the TX format specification determines the horizontal space occupied by the text field (for example, TX16 means 16 spaces wide).

Reference Usage Notes for Embedding Text Fields in Headings

- You cannot embed TX fields in FML free-text lines.
- HEADING or FOOTING lines can contain multiple embedded TX fields; SUBHEAD or SUBFOOT lines may only contain a single embedded TX field instance.

NF782: Oracle Data Adapter IXSPACE Setting

The new IXSPACE setting for the Oracle Data Adapter enables you to override the default parameters for the Oracle index space implicitly created by the CREATE FILE and HOLD FORMAT SQLORA commands.

Specifying Oracle Index Space Parameters

You can specify up to 94 bytes of index space parameters for the SQL CREATE INDEX statement that the data adapter issues when it creates an Oracle table as a result of a CREATE FILE or HOLD FORMAT SQLORA command for a table that has an index defined.

Syntax How to Specify Oracle Index Space Parameters

You can issue the following SET command at the command prompt, in a stored procedure, or in any supported profile

```
SQL [SQLORA] SET IXSPACE [index_spec]
```

where:

index_spec

Consists of up to 94 bytes of valid Oracle index space parameters. To reset the index space parameters to their default values, issue the SET IXSPACE command with no parameters. If the index specification requires more than one line, use the long form of the SQL SET command:

```
SQL [SQLORA]  
SET IXSPACE  
index_spec_line1  
index_spec_line2  
END
```

SQLORA

Indicates the Oracle RDBMS. Omit if you issued the SET SQLENGINE command for Oracle.

Examples of index specification parameters you may want to specify are the tablespace clause, global_index clause, local_index clause, and parallel clause. The data adapter does not verify the validity of the parameters. See the *Oracle SQL Reference Manual* for syntax descriptions.

Example Specifying a Table Space for an Oracle Index

When you issue the CREATE FILE or HOLD FORMAT SQLORA command, the DBSPACE setting determines which table space will be used to contain the resulting Oracle table. In prior releases, the index was always placed in the default table space specified at installation.

You can now specify a table space for the index using the SQL SET IXSPACE command. The following example places the index in the tablespace ORATS1:

```
SQL SQLORA SET IXSPACE TABLESPACE ORATS1
```

As a result of setting this value, any CREATE FILE or HOLD FORMAT SQLORA command will generate an SQL CREATE INDEX statement containing the TABLESPACE clause, if an index is defined for the table. You can see the SQL CREATE INDEX syntax in the FSTRACE4 output.

The data adapter does not verify the validity of the parameters. If they are not valid, the following errors are returned at runtime:

```
(FOC1400)      SQLCODE IS 959 (HEX: 000003BF)
               : ORA-00959: tablespace 'tablename' does not exist
(FOC1414)      EXECUTE IMMEDIATE ERROR.
```

When the SQL SQLORA SET IXSPACE TABLESPACE *tablespacename* command has been issued with a valid table space name, the following line is added to the SET SQLORA? query command output:

```
(FOCxxxx) DEFAULT IXSPACE IS          - : tablespacename
```

If no table space has been set, this line is not displayed.

Example Resetting the IXSPACE Value

The following command resets the IXSPACE parameters to their installation defaults:

```
SQL SQLORA SET IXSPACE
```

NF785: The Adabas Write Data Adapter for FOCUS

You can now use FOCUS to maintain Adabas data sources. This bulletin identifies aspects of the FOCUS file maintenance facilities, MODIFY and Maintain, that are unique for the Adabas environment. MODIFY and Maintain requests read, add, update, and delete records. You can modify single data sources, sets of data sources defined in a multi-segment Master File, or unrelated sets of data sources.

Maintain provides a graphical user interface and event-driven processing. In a Maintain procedure, temporary storage areas called stacks collect data, transaction values, and temporary field values. You can use the Maintain Window Painter facility to design Winforms—windows that display stack values, collect transaction values, and invoke triggers. A trigger implements event-driven processing by associating an action (such as performing a specific case in the Maintain procedure) with an event (such as pressing a particular PF key). Maintain also provides set-based processing through enhanced NEXT, UPDATE, DELETE, and INCLUDE commands.

This bulletin describes differences between the MODIFY and Maintain facilities when these differences affect data adapter processing.

The FOCUS for S/390 documentation contains a detailed discussion of file maintenance with the FOCUS MODIFY and Maintain facilities. Read this documentation carefully before developing MODIFY or Maintain procedures to use with Adabas data sources.

Note: You can maintain up to 64 data sources in a single MODIFY or Maintain procedure. The limit for a MODIFY COMBINE or a Maintain procedure is 16 Master Files; however, each Master File can describe more than one data source, for a total of 64 segments per procedure minus one for the virtual root segment created by the COMBINE command. In addition, a Maintain procedure can call other Maintain procedures that reference additional data sources.

Prerequisites for running MODIFY and Maintain requests include:

- The Write data adapter. The Write component of the data adapter must be installed and operational.
- Proper authorization to perform maintenance operations.
- Existing data sources to modify. If you intend to load new data sources with MODIFY or Maintain, you must generate them first using Adabas utilities.

Activating the Adabas Write Data Adapter

Before you can use any commands that write to an Adabas data source, you must make the following edits to the Master and Access Files:

In the Master File:

- All segments must have SEGTYPE = S0. (For the Read Data Adapter SEGTYPE=S is sufficient.)
- Fields with ACTUAL format Z (zoned) must have a numeric USAGE format (P or I). Format A is supported only for reading an Adabas data source.

Tip: For best performance, you can change ACTUAL format Z to ACTUAL format P in the Master File. In this case, you must also change the ALIAS attribute to contain the length and data type. If the ALIAS was *ff*, and the field length is *lll*, the ALIAS attribute should be coded as:

```
ALIAS = 'ff,lll,P'
```


For example, consider the following field declaration:

```
FIELD = LEAVE_DUE ,ALIAS = AU ,USAGE = P2 ,ACTUAL = Z2 ,
```

You would edit this declaration as follows:

```
FIELD = LEAVE_DUE ,ALIAS = 'AU,2,P' ,USAGE = P2 ,ACTUAL = P2 ,
```

- If two or more fields in the Master File are synonyms (they refer to the same field in the data source and, therefore, have the same ALIAS attribute), only the first field encountered in the Master File can be used in INSERT and UPDATE commands. If a synonym other than the first is used in an INSERT command, it will be ignored. If one is used in an UPDATE command, processing will be terminated with the following error message:

```
(FOC4565) IGNORED ATTEMPT TO CHANGE NONUPDATABLE FIELD
```

In the Access File:

- If a segment has the attribute ACCESS=ADBS you can define a unique key by adding the following attribute:

```
UNQKEYNAME=name
```

where:

name

Is the name of the elementary or group field to be used as the unique key.

The UNQKEYNAME attribute does not necessarily define the key described in the Adabas FDT (option UQ). The data adapter uses it to decide which rules to apply in a NEXT, INCLUDE, DELETE, or UPDATE command. If the UNQKEYNAME attribute does not correspond to the key described with option UQ in the Adabas FDT, Adabas and the data adapter may not agree on whether a segment instance is unique. This can affect the results of INCLUDE commands, as described in [Effect of UNQKEYNAME on INCLUDE Actions for Segments With ACCESS=ADBS](#).

If this attribute is not present, the data adapter uses the rules for modifying a segment with a non-unique key. If it is present, the data adapter uses the rules for modifying a segment with a unique key. Subsequent sections describe these rules.

Note: For modifying Adabas data sources with Maintain, the UNQKEYNAME attribute in the Access File is required. Otherwise you can use only commands that do not change the data source (such as TYPE) and can only issue requests against single-segment data sources.

- We recommend the use of CALLTYPE=FINN instead of CALLTYPE=RL.

Reference AUTOADBS Considerations

You can use AUTOADBS to create a read version of the Master File. To convert it to a Write version, change the SEGTYPE value in all segments to S0.

Limitations on Options Described for the Adabas Data Adapter

When using the Write data adapter, the data adapter automatically sets the values of the following two options:

- ADABAS OPEN is set to YES.
- FETCH is set to OFF for all segments.

Fields That Cannot be Updated

For both MODIFY and Maintain, certain types of fields listed in the Master File cannot be updated. In some cases, the update commands are ignored, and in some cases they generate errors. The following sections contain a detailed explanation.

Reference Using Synonyms

In a Master File, two or more field declarations can refer to the same Adabas field. Each duplicate field declaration after the first is called a synonym. Synonyms can be used in commands that print, but cannot be used in commands that change the data source. The following actions occur as a result of using synonyms in INCLUDE/UPDATE commands:

- Synonym fields used in INCLUDE commands are ignored.
- Synonym fields used in UPDATE commands cause processing to terminate and generate the following error message:

(FOC4565) IGNORED ATTEMPT TO CHANGE NONUPDATABLE FIELD

An UPDATE command was used against a nonupdatable field,
i.e. - field described in AFD as SUB/SUPERDESCRIPTOR or
part of it;
- field that refers in MFD to the same DB field (ALIAS) as another
field (synonym case).

Reference Fields That Cannot Be Updated in MODIFY

In MODIFY, update commands for the following types of fields are ignored:

- Counter fields (ALIAS=xxC).
- ORDER fields (ALIAS=ORDER).
- Group fields (UPDATE ignored).

In MODIFY, update commands for the following types of fields generate an error:

- Synonyms (see [Using Synonyms](#)).
- Fields created from sub- or superdescriptors (as defined in the Access File).

Reference Fields That Cannot Be Updated in Maintain

Maintain generates an error in response to update commands for the following types of fields:

- Counter fields (ALIAS=xxC).
- ORDER fields (ALIAS=ORDER).
- Unique key fields (fields specified by the UNQKEYNAME attribute in the Access File).
- Synonyms (see [Using Synonyms](#)).

Checking Adabas Return Codes and FOCUS Error Message Numbers

The Dialogue Manager status return variable, &RETCODE, indicates the status of FOCUS requests. You can use it to test Adabas return codes. The &RETCODE variable contains the last return code resulting from an executed report request or MODIFY request.

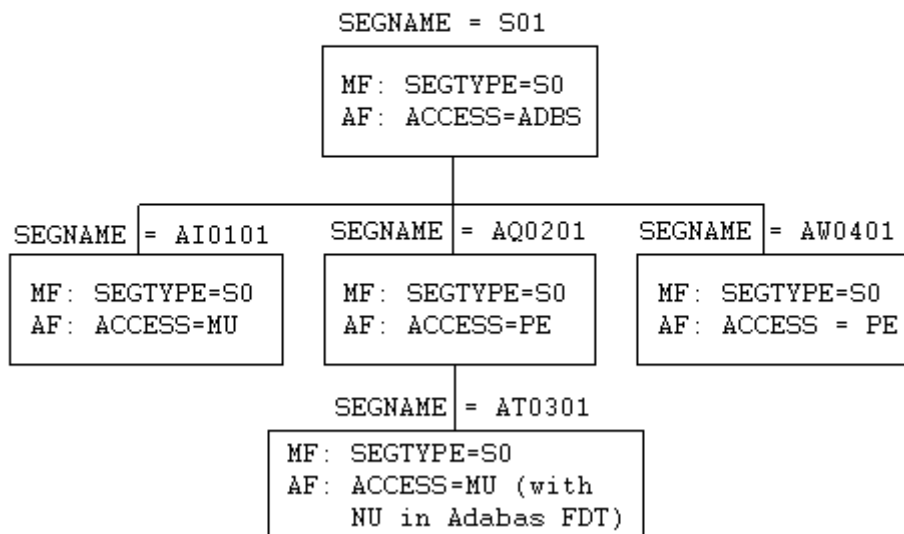
In a Dialogue Manager request, you can use a -IF statement to test the &RETCODE value against a specified Adabas return code. Then, you can take corrective actions based on the result of the -IF test. An Adabas return code of zero (0) indicates a successful execution, a non-zero return code indicates an error.

Another useful Dialogue Manager variable, &FOCERRNUM, stores the last FOCUS or data adapter (not Adabas) error number generated by the execution of a FOCEXEC. See your FOCUS for S/390 documentation for information about &FOCERRNUM and other statistical variables.

Adabas Write Examples

The examples in this document access the EMPLOYEES-WRITE data source.

Adabas Structure of EMPWRITE View
of EMPLOYEES-WRITE Data Source



Example Sample Adabas Write Master File

This Master File provides write access to the Adabas EMPLOYEES-WRITE data source:

```
FILENAME=EMPWRITE,SUFFIX=ADBSIN,$
SEGNAME=S01,SEGTYPE=S0,$
FIELD= EMPLOYEE_ID,ALIAS= AA,A8,A8,INDEX=I,$
GROUP= FULL_NAME,ALIAS= AB,A60,A60,$
FIELD=FIRST_NAME,ALIAS= AC,A20,A20,$
FIELD=LAST_NAME,ALIAS= AE,A20,A20,INDEX=I,$
FIELD=MIDDLE_NAME,ALIAS= AD,A20,A20,$
FIELD=ADDRESS_LINE_CNT,ALIAS= AIC,I4,I1,$
FIELD=CITY,ALIAS= AJ,A20,A20,INDEX=I,$
FIELD=ZIP_CODE,ALIAS= AK,A10,A10,$
FIELD=POST_CODE,ALIAS= AK,A10,A10,$
FIELD=COUNTRY,ALIAS= AL,A3,A3,$
FIELD= DEPT,ALIAS= AO,A6,A6,INDEX=I,$
FIELD= INCOME_CNT,ALIAS= AQC,I4,I1,$
GROUP= LEAVE_DATA,ALIAS= A3,A16,A4,$
FIELD=LEAVE_DUE,ALIAS= AU,P2,Z2,$
FIELD=LEAVE_TAKEN,ALIAS= AV,P2,Z2,$
FIELD= LEAVE_BOOKED_CNT,ALIAS= AWC,I4,I1,$
FIELD= DEPARTMENT,ALIAS= S1,A4,A4,INDEX=I,$
GROUP= DEPT_PERSON,ALIAS= S2,A26,A26,INDEX=I,$
FIELD=DEPT_S03,ALIAS= AO,A6,A6,INDEX=I,$
FIELD=NAME_S03,ALIAS= AE,A20,A20,INDEX=I,$
SEGNAME=AI0101,SEGTYPE=S0,PARENT=S01,OCCURS=AIC,$ MAX= 8
FIELD= ADDRESS_LINE,ALIAS= AI,A20,A20,$
FIELD= AI0101_OCC,ALIAS= ORDER,I4,I1,$
```

```
SEGNAME=AQ0201 ,SEGTYPE=S0,PARENT=S01 ,OCCURS=AQC,$ MAX= 40
$PEMU = INCOME ,ALIAS= AQ ,A19 ,A13 ,,$
FIELD=CURR_CODE ,ALIAS= AR ,A3 ,A3 ,,$
FIELD=SALARY ,ALIAS= AS ,P9 ,P5 ,,$
FIELD=BONUS_CNT ,ALIAS= ATC ,I4 ,I1 ,,$
FIELD= AQ0201_OCC ,ALIAS= ORDER ,I4 ,I1 ,,$
```

```
SEGNAME=AT0301 ,SEGTYPE=S0,PARENT=AQ0201,OCCURS=ATC,$ MAX= 12
FIELD= BONUS ,ALIAS= AT ,P9 ,P5 ,,$
FIELD= AT0301_OCC ,ALIAS= ORDER ,I4 ,I1 ,,$
```

```
SEGNAME=AW0401 ,SEGTYPE=S0,PARENT=S01 ,OCCURS=AWC,$ MAX= 20
GROUP= LEAVE_BOOKED ,ALIAS= AW ,A16 ,A12 ,,$
FIELD=LEAVE_START ,ALIAS= AX ,P6 ,Z6 ,,$
FIELD=LEAVE_END ,ALIAS= AY ,P6 ,Z6 ,,$
FIELD= AW0401_OCC ,ALIAS= ORDER ,I4 ,I1 ,,$
```


Example Sample Adabas Write Access File

The following Access File corresponds to the Master File illustrated in [Sample Adabas Write Master File](#):

```
RELEASE=6.2, OPEN=YES,$
```

```
$ ADABAS FILE = EMPLOYEES_WRITE          DICTIONARY =
SEGNAM=S01    ,ACCESS=ADBS,FILENO=042,DBNO=1,CALLTYPE=FIND,
  UNQKEYNAME=EMPLOYEE_ID                  , $
FIELD= DEPARTMENT                        ,TYPE=NOP      , $
FIELD= DEPT_PERSON                        ,TYPE=SPR       , $
FIELD=DEPT_S03                            ,TYPE=DSC,NU=NO   , $
FIELD=NAME_S03                            ,TYPE=DSC,NU=NO   , $
SEGNAM=AI0101,ACCESS=MU    ,FILENO=042,DBNO=1,$ ADDRESS_LINE
SEGNAM=AQ0201,ACCESS=PE    ,FILENO=042,DBNO=1,$ INCOME
SEGNAM=AT0301,ACCESS=MU    ,FILENO=042,DBNO=1,$ BONUS
SEGNAM=AW0401,ACCESS=PE    ,FILENO=042,DBNO=1,$ LEAVE_BOOKED
```

Types of Transaction Processing

You can process incoming transactions by comparing (or matching on) the following types of fields:

- For segments with a unique key:
 - A unique key field or superset of the key (unique key plus any number of non-unique key fields or non-key fields.
 - A non-unique key field or a non-key field that is used as a non-unique key field, as described in [Descriptor Considerations](#).

- For segments with a non-unique key:
 - Any field when issuing NEXT or INCLUDE commands in a subrequest (after at least one initial MATCH or NEXT command). Any field can be used as a unique key for these commands.

In MODIFY, a MATCH on a non-unique key in a segment with a unique key may retrieve more than one record instance. MATCH returns only the first instance of this answer set; subsequent sections demonstrate how to use NEXT to retrieve the remaining instances.

In Maintain, MATCH always matches on the unique key and retrieves at most one record instance. To match on a non-unique key in Maintain, you use the NEXT command without a prior MATCH. The Maintain implementation of the NEXT command fetches the entire answer set returned by Adabas directly into a stack. It also includes three optional phrases:

- The FOR phrase determines how many records to retrieve.
- The WHERE phrase defines retrieval criteria.
- The INTO phrase names a stack to receive the returned records.

See the FOCUS for S/390 documentation for complete syntax.

Descriptor Considerations

Descriptors (or inverted lists) enhance the performance of data maintenance routines, especially when created on the data source's unique key. Without a descriptor, Adabas must read the entire data source to locate particular record instances; with a descriptor, Adabas can access record instances directly when given search values for the descriptor fields. A data source can have several associated descriptors. Descriptors created for performance reasons can be unique or non-unique. To use FOCUS referential integrity, create descriptors on lower level segments in the Master File.

If all of the following conditions are true, non-descriptor (non-key) fields can be used as non-unique descriptor fields:

- The Access File defaults to or specifies `CALLTYPE=FOUND`.
- The command `SET NDFIND=NO` was not issued (by default, `NDFIND=YES`).
- The Adabas session parameter `NONDES` is set to `YES` (the default).

You can define a unique key in a data source. When a key is unique, the concatenated values of the key fields in one record cannot be duplicated in any other record. A unique descriptor is generally defined on a unique key. Once you create it, Adabas automatically prevents the insertion of duplicate key values. Any attempt to insert a duplicate record instance generates an error message.

An example of a unique descriptor on a unique key is the employee ID in the sample EMPWRITE data source. Since no two employees can have the same employee number, the value in the EMPLOYEE_ID field makes each record unique:

EMPLOYEE_ID	LAST_NAME	FIRST_NAME
-----	-----	-----
50004300	GUERIN	MICHELE
50004600	VERDIE	BERNARD
50004900	CAUDAL	ALBERT
50005500	BRAUN	ALEXANDRE
50005800	GUENTER	SIMONE

You cannot add another record with EMPLOYEE_ID 50004300 to this data source.

Any segment below the root always has a unique key—the ORDER field. You can also use another field as either a non-unique key field (for example, SALARY) or as a unique key, if you are sure that none of the values are duplicated (for example, LEAVE_START).

Modifying Data

With the FOCUS MODIFY and Maintain facilities, you can add new records to a data source, update field values for specific records, or delete specific records.

The data adapter processes a MODIFY or Maintain transaction with the following steps:

1. FOCUS reads the transaction for incoming data values.
2. The data adapter generates the appropriate calls to Adabas based on the MATCH or NEXT criteria.

3. Adabas either returns an answer set consisting of one or more records that satisfy the request, or determines that the record does not exist.
4. After Adabas returns the answer set and/or return code, the data adapter either
 - Performs the update operation (UPDATE or DELETE) on the returned answer set. With MODIFY, the data adapter processes one record at a time; with Maintain, it can either process one record at a time or a set of records.
 - Creates the new record (INCLUDE). In Maintain, it may create multiple records.
5. Adabas changes the database appropriately.

In MODIFY, you must use the NEXT command to process a multi-record answer set one record at a time. Each NEXT command puts you physically at the next logical record in the answer set created by the most recent MATCH command for this segment. In Maintain, one NEXT command can process a multi-record answer set without a prior MATCH.

The MATCH Command

In response to a MATCH command, the data adapter selects the first record in the data source that meets the MATCH criteria.

The MATCH command compares incoming data with one or more field values and then performs actions that depend on whether or not a record with matching field values exists in the data source.

The syntax of the MATCH command in MODIFY is

```
MATCH field1 [ field2...fieldn ]  
  ON MATCH action_1  
  ON NOMATCH action_2
```

where:

fieldn

Are fields in any segment of the Master File. FOCUS compares incoming data values against existing field values. The fields can be any combination of key and/or non-key fields. Specify complete fieldnames; MATCH does not support truncated names.

action_1

Is the operation to perform when a record's values match the incoming data values.

action_2

Is the operation to perform when a record's existing values do not match the incoming data values.

The FOCUS for S/390 documentation discusses these actions in detail.

MATCH processing for multi-segment Master Files is the same as for a multi-segment FOCUS database.

Acceptable actions for MATCH commands fall into eight groups. They are operations that:

- Include, change, or delete records.
- Control MATCH processing, such as rejecting the current transaction.
- Read incoming data fields.
- Perform computations and validations, or type messages to the terminal.

- Control case logic.
- Control multiple-record processing.
- Activate and deactivate fields in MODIFY.
- Permanently store data in the Adabas data source.

Data Adapter MATCH Behavior

In MODIFY requests, there are two major differences in the way MATCH commands function for the data adapter and for native FOCUS:

- With the data adapter, you can change the value of a data source's unique key (subject to Adabas limitations) using the UPDATE command. When modifying a FOCUS data source, you cannot change key field values.
- You can MATCH on *any* field or combination of fields in the record. However, if the full unique key is not included in the MATCH criteria, the data adapter may retrieve more than one record as a result of the MATCH. For example, if the unique key is EMPLOYEE_ID and the incoming value for MATCH LAST_NAME is SMITH, the answer set contains all records with last name SMITH.

Note: In Maintain, MATCH functions identically for the data adapter and for native FOCUS.

Example Using the MODIFY MATCH Command

Consider a MODIFY request that maintains the EMPWRITE data source. It prompts for an employee ID and for a new number of leave days; then it processes the incoming data. The annotated request contains the following MATCH commands:

```
MODIFY FILE EMPWRITE  
PROMPT EMPLOYEE_ID LEAVE_DUE  
1. MATCH EMPLOYEE_ID  
2. ON MATCH UPDATE LEAVE_DUE  
3. ON NOMATCH REJECT  
DATA
```

The incoming transaction contains the following values:

```
EMPLOYEE_ID = 12345678  
LEAVE_DUE = 20
```

The request processes as follows:

1. The MATCH command compares the value of the incoming EMPLOYEE_ID, 12345678, to the EMPLOYEE_ID values in the records of the EMPWRITE data source. Since EMPLOYEE_ID is the unique key of this data source, Adabas can return at most one record as a result of this MATCH.
2. If a record exists for EMPLOYEE_ID 12345678, the MATCH command updates the LEAVE_DUE value of that record with the incoming value 20.
3. If no record exists for EMPLOYEE_ID 12345678, the MATCH command rejects the transaction.

In Maintain, you do not have to include an ON NOMATCH command in order to reject a transaction; Maintain automatically rejects a transaction that does not satisfy the MATCH criteria.

The NEXT Command

In MODIFY, the NEXT command provides a flexible means of processing multi-record answer sets by moving the current position in the answer set from one record to the next.

The syntax is

```
NEXT field
    ON NEXT action_1
    ON NONEXT action_2
```

where:

field

Is any field in the current segment. This field does not affect subsequent actions.

action_1

Is the operation to perform when there is a subsequent record in the answer set. May be any of the acceptable actions listed for MATCH in [The MATCH Command](#).

action_2

Is the operation to perform when no more records exist in the answer set. The CALLTYPE parameter in the Access File controls the sort order for NEXT. It determines whether to retrieve records in physical order (CALLTYPE= FIND) or sorted by the unique key (CALLTYPE= RL).

Your choice of MATCH and NEXT command combinations determines the contents of the answer set. Subsequent sections explain these choices in more detail:

- NEXT command without a MATCH command. The data adapter requests the retrieval of all records in the data source in physical order (CALLTYPE= FIND) or sorted by the unique key (CALLTYPE= RL).
- MATCH on the unique key. The MATCH returns the single record that is the starting point for any subsequent NEXT commands, which retrieve the remaining records in the answer set in physical order (CALLTYPE= FIND) or sorted by the unique key (CALLTYPE= RL).

- MATCH on a non-unique key field. Adabas returns a multi-record answer set in which each record satisfies the MATCH criteria. The data adapter requests the retrieval of these records in physical order.

You can also use NEXT commands with multi-segment structures (FOCUS views) to modify or display data in either case logic or non-case logic requests. If your MATCH or NEXT specifies a record from a parent segment in a multi-segment structure, that record becomes the current position in the parent segment.

A subsequent NEXT on a field in a descendant of that segment retrieves the first descendant record in the related segment. In MODIFY:

- Without case logic, you can retrieve all parent records in the segment and only the first descendant record of any specified related segment.
- With case logic, you can retrieve all records for each segment defined in a multi-segment Master File. To do so, first MATCH on the parent. Then, in another case, use NEXT to loop through the related segments (at the lowest level) until there are no more related instances. On NONEXT, return to the parent case for the next parent instance.

You can trace case logic with the FOCUS trace facility. To invoke the trace facility, include the TRACE command on a separate line after the MODIFY FILE command. You can also use the data adapter trace facilities, described in Technical Memo 7966, *Adabas Interface: Using Traces*.

The following sections illustrate different combinations of MATCH and NEXT command with annotated examples. The MODIFY requests have been kept simple for purposes of illustration; you can create more sophisticated procedures.

Note: In Maintain:

- The syntax of the NEXT command includes optional FOR and WHERE phrases that control the number of records retrieved into a stack. As in MODIFY, the CALLTYPE attribute in the Access File determines whether NEXT returns records in physical order or unique key order.
- NEXT always starts its retrieval at the current database position; it will not retrieve a record it has already passed in its retrieval path unless you use the REPOSITION command to reset the current position.

Also as in MODIFY, once you MATCH on a parent segment, a subsequent NEXT on a child segment retrieves descendant records within the parent established by the MATCH. However, one NEXT command can retrieve all such child instances, without case logic.

- The UPDATE, DELETE, and INCLUDE commands also incorporate the optional FOR phrase to process multiple records from a stack.

For complete details, see the *Maintaining Databases* manual.

NEXT Processing Without MATCH

If you use a NEXT command without a previous MATCH command in a MODIFY request, Adabas returns an answer set consisting of all records in the data source in physical order (CALLTYPE=Find) or sorted by the unique key (CALLTYPE=RL). Use the ON NEXT command to view each record in the order determined by the CALLTYPE attribute. In a Maintain request, the FOR and WHERE phrases in the NEXT command determine the number of records retrieved, in the order determined by the CALLTYPE attribute.

Example Using NEXT Without MATCH in MODIFY

In this MODIFY example, the NEXT command retrieves each record in physical order because the Access File contains the attribute CALLTYPE= FIND:

```
MODIFY FILE EMPWRITE
NEXT EMPLOYEE_ID
  ON NEXT TYPE "EMPLOYEE ID: <D.EMPLOYEE_ID LAST NAME: <D.LAST_NAME "
  ON NONEXT GOTO EXIT
DATA
END
```

The TYPE commands display the following on the screen:

```
EMPLOYEE ID: 50005800 LAST NAME: GUENTER
EMPLOYEE ID: 50005500 LAST NAME: BRAUN
EMPLOYEE ID: 50004900 LAST NAME: CAOUDAL
EMPLOYEE ID: 50004600 LAST NAME: VERDIE
EMPLOYEE ID: 50004300 LAST NAME: GUERIN
EMPLOYEE ID: 50004200 LAST NAME: VAUZELLE
EMPLOYEE ID: 50004100 LAST NAME: CHAPUIS
EMPLOYEE ID: 50004000 LAST NAME: MONTASSIER
EMPLOYEE ID: 50003800 LAST NAME: JOUSSELIN
EMPLOYEE ID: 50006900 LAST NAME: BAILLET
.
.
.
```

If the Access File contained the attribute CALLTYPE=RL, the records would be retrieved in order of employee ID number.

Example Using NEXT in Maintain

The following Maintain procedure retrieves the same answer set into a stack named INSTACK and displays the retrieved values on a Winform named WIN1 (consult the *Maintaining Databases* manual for instructions on creating Winforms):

```
MAINTAIN FILE EMPWRITE  
INFER EMPLOYEE_ID LAST_NAME INTO INSTACK  
FOR ALL NEXT EMPLOYEE_ID INTO INSTACK  
WINFORM SHOW WIN1  
END
```

The following Winform displays as a result of this procedure:

NEXT without prior MATCH

EMPLOYEE_ID	LAST_NAME
50005800	GUENTER
50005500	BRAUN
50004900	CAUDAL
50004600	VERDIE
50004300	GUERIN
50004200	VAUZELLE
50004100	CHAPUIS
50004000	MONTASSIER
50003800	JOUSSELIN

Exit

NEXT Processing After MATCH on a Unique Key

In MODIFY, NEXT processing is identical for either MATCH on a full unique key or MATCH on a superset (full unique key plus a non-key field).

When the initial MATCH is successful, Adabas retrieves one record. This establishes the logical position in the data source. The subsequent NEXT command causes Adabas to retrieve all records following the matched record in physical order (CALLTYPE=FOUND) or key sequence (CALLTYPE=RL).

Example Using NEXT After MATCH on a Full Unique Key in MODIFY

The following is an example of NEXT processing after a MATCH on a full unique key, the EMPLOYEE_ID field:

```
MODIFY FILE EMPWRITE
CRTFORM LINE 1
" PLEASE ENTER VALID EMPLOYEE ID </1"
1. " EMP: <EMPLOYEE_ID  "
2. MATCH EMPLOYEE_ID
   ON NOMATCH REJECT
3. ON MATCH GOTO GETREST
   CASE GETREST
4. NEXT EMPLOYEE_ID
   ON NEXT CRTFORM LINE 10
   " EMPLOYEE_ID: <D.EMPLOYEE_ID  LAST_NAME: <D.LAST_NAME  "
   ON NEXT GOTO GETREST
5. ON NONEXT GOTO EXIT
   ENDCASE
DATA
END
```

The MODIFY procedure processes as follows:

1. The user enters the employee ID for the search, 20009000.

2. The MATCH command causes Adabas to search the data source for the entered value. If no such record exists, the transaction is rejected.
3. If the specified value matches a value in the EMPLOYEE_ID field of the data source, the procedure branches to the GETREST case; it contains the NEXT command.
4. The NEXT command retrieves the next record based on physical order, if the Access File contains the attribute CALLTYPE=FINN, or based on the sequence of EMPLOYEE_ID, if the Access File specifies CALLTYPE=RL. If such a record exists, the procedure displays the values of the EMPLOYEE_ID and LAST_NAME fields. It continues to display each record in the order determined by the CALLTYPE attribute of the key field, EMPLOYEE_ID.
5. If there are no more records, the procedure ends.

The output after executing this MODIFY procedure with CALLTYPE=FINN is:

```
PLEASE ENTER VALID EMPLOYEE ID                                (line 1)

EMP: 20009000                                                  (line 3)

EMPLOYEE_ID: 50005800    LAST_NAME:  GUENTER                  (line 10)

EMPLOYEE_ID: 50005500    LAST_NAME:  BRAUN                    (line 10)

EMPLOYEE_ID: 50004900    LAST_NAME:  CAUDAL                    (line 10)

EMPLOYEE_ID: 50004600    LAST_NAME:  VERDIE                    (line 10)

EMPLOYEE_ID: 50004300    LAST_NAME:  GUERIN                    (line 10)
```

Because of the NEXT command, all employees whose records are physically after 20009000 display one at a time on the screen.

The output after executing this MODIFY procedure with CALLTYPE=RL is:

```
PLEASE ENTER VALID EMPLOYEE ID                                (line 1)

EMP: 20009000                                                  (line 3)

EMPLOYEE_ID: 20009100    LAST_NAME: JENSON                    (line 10)
EMPLOYEE_ID: 20009200    LAST_NAME: MEYER                     (line 10)
EMPLOYEE_ID: 20009300    LAST_NAME: SMITH                     (line 10)
EMPLOYEE_ID: 20009400    LAST_NAME: OLLE                      (line 10)
EMPLOYEE_ID: 20009500    LAST_NAME: RAY                       (line 10)
```

Notice that the employee ids after 20009000 are retrieved in key sequence.

Example Using NEXT on a Full Unique Key in Maintain

The following Maintain procedure retrieves the same answer set into a stack named EMPSTACK. Assume that when Maintain displays the Winform called WIN1, the user enters the transaction value, 20009000, into a stack named TRANS and clicks the NextRecs button to invoke the NEXTRECS case:

```
MAINTAIN FILE EMPWRITE
INFER EMPLOYEE_ID LAST_NAME INTO EMPSTACK
WINFORM SHOW WIN1
CASE NEXTRECS
    FOR ALL NEXT EMPLOYEE_ID INTO EMPSTACK WHERE EMPLOYEE_ID GT
    TRANS.EMPLOYEE_ID
ENDCASE
END
```

The following Winform displays when 20009000 is entered in the EMPLOYEE_ID field with CALLTYPE=Find:

Enter an employee id: 20009000

EMPLOYEE_ID	LAST_NAME	
50005800	GUENTER	^ █ v
50005500	BRAUN	
50004900	CAUDAL	
50004600	VERDIE	
50004300	GUERIN	
50004200	VAUZELLE	
50004100	CHAPUIS	

NextRecs

Exit

NEXT Processing After MATCH on a Non-Unique Key

In a MODIFY request processed by the data adapter, you do not have to MATCH on the full set of unique key fields. You can match on a non-key field or non-unique key. (Maintain always matches on the full unique key, regardless of which fields you specify in the MATCH command.)

When you MATCH on a non-unique key, multiple records may satisfy the MATCH condition. The MATCH operation retrieves the first record of the answer set, and the NEXT command makes the remaining records in the answer set available to the program in physical order. In this case, the order of retrieval for NEXT is always the physical sequence. MATCH on a non-key field should always be processed using CALLTYPE=Find to prevent the data adapter from issuing an inefficient Read Physical call. For more information see the *FOCUS for IBM Mainframe ADABAS Interface User's Manual and Installation Guide*.

Example Using MATCH on a Non-Unique Key in MODIFY

This annotated procedure is the same procedure described in [Using NEXT After MATCH on a Full Unique Key in MODIFY](#), altered to MATCH on the non-unique key field LAST_NAME. The NEXT operation retrieves the subsequent records from the answer set in physical sequence:

```
MODIFY FILE EMPWRITE
CRTFORM LINE 1
" PLEASE ENTER A LAST NAME </1 "
1. " LAST_NAME: <LAST_NAME </1"
2. MATCH LAST_NAME
   ON NOMATCH REJECT
3. ON MATCH CRTFORM LINE 5
   " EMPLOYEE_ID: <D.EMPLOYEE_ID LAST_NAME: <D.LAST_NAME "
4. ON MATCH GOTO GETSAME
   CASE GETSAME
5. NEXT LAST_NAME
   ON NEXT CRTFORM LINE 10
   " EMPLOYEE_ID: <D.EMPLOYEE_ID LAST_NAME: <D.LAST_NAME "
   ON NEXT GOTO GETSAME
6. ON NONEXT GOTO EXIT
   ENDCASE
   DATA
   END
```

The MODIFY procedure processes as follows:

1. The user enters the last name (LAST_NAME) for the search, SMITH.
2. The MATCH command causes Adabas to search the data source for all records with the value SMITH and return them in physical order. If the value SMITH does not exist, the transaction is rejected.
3. If the incoming value matches a value in the data source, the procedure displays the employee ID and last name. (This is the first record of the answer set.)
4. After displaying the record, the procedure goes to the GETSAME case; it uses NEXT to loop through the remaining records in the answer set.

5. Instead of retrieving the next logical record with a higher key value as in the previous example, the procedure retrieves the next record in the answer set (all records in the answer set have the last name SMITH). If any exist, they display on the screen in physical order.
6. When no more records exist with the value SMITH, the procedure ends.

The output from this MODIFY procedure follows:

```
PLEASE ENTER A LAST NAME
```

```
LAST_NAME  smith
```

```
EMPLOYEE_ID  40000311  LAST_NAME:  SMITH
```

```
EMPLOYEE_ID:  20009300  LAST_NAME:  SMITH
```

```
EMPLOYEE_ID:  20014100  LAST_NAME:  SMITH
```

```
.  
.
.
```

```
EMPLOYEE_ID:  30038013  LAST_NAME:  SMITH
```

A line displays on the screen for each employee with the last name SMITH. Employee ID 40000311 is the result of the MATCH operation; employee ID 20009300 is the result of the NEXT operation, employee ID 30038013 is the result of the last NEXT operation. Notice that the records are retrieved in physical sequence, and order is not dependent on the CALLTYPE attribute.

Example Using NEXT on a Non-Unique Key Field in Maintain

The following Maintain procedure retrieves the entire answer set into a stack named EMPSTACK. Assume that when Maintain displays the Winform named WINA, the user enters the transaction value (SMITH) into the first record of a stack named TRANS and clicks the NextRecs button to invoke the NEXTRECS case:

```
MAINTAIN FILE EMPWRITE
INFER EMPLOYEE_ID LAST_NAME INTO EMPSTACK
WINFORM SHOW WINA
CASE NEXTRECS
  FOR ALL NEXT EMPLOYEE_ID INTO EMPSTACK WHERE LAST_NAME EQ
  TRANS.LAST_NAME
ENDCASE
END
```

The following Winform displays when the NexRecs button is pressed with SMITH entered in the Last_Name field:

Last_Name : SMITH

EMPLOYEE_ID	LAST_NAME
40000311	SMITH
20009300	SMITH
20014100	SMITH
20015400	SMITH
20018800	SMITH
20023600	SMITH

NextRecs

Exit

INCLUDE, UPDATE, and DELETE Processing

While MATCH and NEXT operations in MODIFY can operate on unique key or non-unique key fields and return single or multi-record answer sets, the MODIFY commands INCLUDE, UPDATE, and DELETE must always identify the target records by their unique key. Therefore, in MODIFY, each update operation affects at most one record. (In Maintain, the FOR phrase in the update command determines the number of records affected.)

Reference Rules for Inserting Records Into an Adabas Data Source

- For a segment with a unique key:
The unique key field value is used to insert the target segment. If any additional MATCH criteria are supplied for a segment in the path, they will be used to qualify that path segment.
An attempt to use MATCH on a non-unique key before an INCLUDE command generates the following error message:
`(FOC4563) INCORRECT INCLUDE REQUEST FOR NON UNIQUE KEY`
- For a segment with a non-unique key or no key:
If you want to insert an additional record for an existing key field, you must MATCH on the key field and specify ON MATCH INCLUDE.
- For segments with ACCESS=PE or MU, if a new occurrence is inserted, you must set the occurrence number (ORDER field) to 0 (zero indicates the next occurrence) or to a value greater than the number of existing occurrences. This new occurrence is always inserted after the last existing occurrence. For example, if a PE or MU segment has two existing occurrences, the next occurrence added will always be the third. If the occurrence with the given number already exists, processing will terminate with the following message:
`(FOC4564) THIS OCCURRENCE ALREADY EXISTS. USE UPDATE COMMAND.`
You should use the UPDATE command instead of INCLUDE in this case.
- For segments with ACCESS=MU, if the corresponding field with the MU option is defined *without* the NU option on the second level of the Adabas FDT (that is, it is part of a periodic group (PE) or simple group (GR)):

- If an INCLUDE command is issued for the root segment alone, Adabas automatically inserts an empty child (MU) segment and, if this child segment has a parent with ACCESS=PE, an empty parent segment.
- If an INCLUDE command is issued for the root and a parent (PE) of the MU segment simultaneously, but without values for the child (MU) segment, Adabas automatically inserts an empty child (MU) segment. The data adapter automatically inserts the first occurrence of the parent (PE) segment using the values from the INCLUDE command.
- If an INCLUDE command is issued for the root, parent (PE), and child (MU) segments simultaneously, the data adapter inserts the first occurrence of both the child and parent segments using the values from the INCLUDE command.
- For segments with ACCESS=MU, if the corresponding field with the MU option is defined *with* the NU option on *any* level in the Adabas FDT, Adabas automatically suppresses the empty values. An INCLUDE command can be issued for the parent and child segments separately or simultaneously.

Note: The Master File does not identify the level of an MU field because if the MU field belongs to a simple group, the Master File does not describe this group. (However, if AUTOADBS created the Master File, there will be a commented declaration for the group.) Therefore, FOCUS cannot determine whether Adabas will add an empty occurrence for the corresponding segment. You must be aware of the options in the Adabas FDT to understand the behavior that occurs in response to an INCLUDE command for an MU segment.

Effect of UNQKEYNAME on INCLUDE Actions for Segments With ACCESS=ADBS

The UNQKEYNAME attribute in the Access File determines how the data adapter presents an INCLUDE command to Adabas. The option UQ in the Adabas FDT and the specific fields used in the MATCH command determine whether Adabas actually inserts the segment instance. The following table describes how these factors affect the result of the INCLUDE command. Assume that the Access File specifies UNQKEYNAME=EMPLOYEE_ID and that the employee id value EMPID005 already exists in the data source:

Result of INCLUDE Command for Existing EMPLOYEE_ID EMPID005

EMPLOYEE_ID has option UQ in FDT	Fields in MATCH command	Instance Inserted (ON NOMATCH)
No	EMPLOYEE_ID only	ON MATCH case performed
Yes	EMPLOYEE_ID only	ON MATCH case performed

EMPLOYEE_ID has option UQ in FDT	Fields in MATCH command	Instance Inserted (ON NOMATCH)
No	EMPLOYEE_ID plus fields with values that do not already exist	Yes
Yes	EMPLOYEE_ID plus fields with values that do not already exist	No - error (FOC4561), RC=198

This table describes INCLUDE actions when EMPLOYEE_ID is not in the MATCH field list:

Result of INCLUDE Command Without Matching on Field EMPLOYEE_ID

UNQKEYNAME = EMPLOYEE_ID?	Instance Inserted
Yes	No - error (FOC4563)
No	Yes

Reference Rules for Deleting Records From an Adabas Data Source

- For a segment with a unique key, the key field value is used to delete the target segment.

- For a segment with a non-unique key, you must supply the key field. If the MATCH criteria for this type of segment, in the path or target, do not identify a unique occurrence, the first occurrence found will be deleted. The use of Adabas descriptors for this type of segment is highly recommended for efficiency.
- For a segment with no key, you must supply at least one MATCH condition. If the MATCH criteria for this type of segment, in the path or target, do not identify a unique occurrence, the first occurrence found will be deleted.
- A segment occurrence with ACCESS=PE or MU is deleted from the data source except if it is the last occurrence for an ACCESS=PE segment. Adabas will only delete the last occurrence if all fields have the NU option in the FDT; if they do not all have this option, the occurrence will have empty values in all fields.
- When you delete segments that have dependent segments, the DELETED counter for the session may have an incorrect value. For a first level segment with descendants, this counter will always be incorrect. For a second level segment, this counter will be incorrect if there are multiple descendant segments. For a third level segment, this counter is always correct.

Reference Rules for Updating Records in an Adabas Data Source

- For a segment with a unique key, the key field value and any additional MATCH criteria are used to qualify the target segment for update.
- For a segment with a non-unique key, you must supply the key field. If the MATCH criteria for this type of segment, in the path or target, do not identify a unique occurrence, the first occurrence found will be updated. The use of Adabas descriptors for this type of segment is highly recommended for efficiency.
- For a segment with no key, you must supply at least one MATCH condition. If the MATCH criteria for this type of segment, in the path or target, do not identify a unique occurrence, the first occurrence found will be updated.

Example Updating Adabas Records With MODIFY

Suppose you want to display all the employees in a department and update the amount of leave they have taken:

```
MODIFY FILE EMPWRITE
CRTFORM LINE 1
" PLEASE ENTER A VALID DEPARTMENT </1"
1. " DEPARTMENT: <DEPARTMENT "
2. MATCH DEPARTMENT
   ON NOMATCH REJECT
   ON MATCH CRTFORM LINE 10
3. "ID: <D.EMPLOYEE_ID LEAVE DUE: <D.LEAVE_DUE> TAKEN <T.LEAVE_TAKEN> "
4. ON MATCH UPDATE LEAVE_TAKEN
   ON MATCH GOTO GETREST
   CASE GETREST
5. NEXT EMPLOYEE_ID
   ON NEXT CRTFORM LINE 10
   "ID: <D.EMPLOYEE_ID LEAVE DUE: <D.LEAVE_DUE> TAKEN <T.LEAVE_TAKEN> "
   ON NEXT UPDATE LEAVE_TAKEN
   ON NEXT GOTO GETREST
6. ON NONEXT GOTO EXIT
   ENDCASE
   DATA
   END
```

The MODIFY procedure processes as follows:

1. The user enters the department (DEPARTMENT) for the search, PROD.
2. The MATCH command causes Adabas to search the data source for the first record with the value PROD and return them in physical sequence. If none exists, the transaction is rejected.
3. If the supplied value matches a database value, the procedure displays it.

4. The procedure updates the LEAVE_TAKEN field for the first retrieved record using the turnaround value from the CRTFORM. EMPLOYEE_ID establishes the target record for the update.
5. Each time it executes the NEXT, the procedure retrieves the next record with the same department, PROD. It displays each one in physical order. It updates the LEAVE_TAKEN field for each retrieved record with the turnaround value.
6. When no more records exist for department PROD, the procedure ends.

Example Updating Adabas Records With Maintain

In Maintain, you can use stack columns as turnaround values to update a data source. The following annotated Maintain request updates the same records as the preceding MODIFY request:

- ```
MAINTAIN FILE EMPWRITE
INFER EMPLOYEE_ID LEAVE_DUE LEAVE_TAKEN INTO EMPSTACK
```
1. WINFORM SHOW WIN1
  2. CASE MATCHREC

```
 FOR ALL NEXT EMPLOYEE_ID INTO EMPSTACK
 WHERE DEPARTMENT EQ VALSTACK.DEPARTMENT
ENDCASE
```
  3. CASE UPDLV

```
 FOR ALL UPDATE LEAVE_TAKEN FROM EMPSTACK
ENDCASE
END
```

The Maintain procedure processes as follows:

1. A Winform named WIN1 displays. Assume that it displays an entry field labeled DEPARTMENT (whose source and destination stack is called VALSTACK) and a grid (scrollable data source) with columns EMPLOYEE\_ID, LEAVE\_DUE and LEAVE\_TAKEN. See the *Maintaining Databases* manual for instructions on creating Winforms.
2. The user enters a DEPARTMENT value for the search and clicks the GetEmps button to invoke case MATCHREC. Case MATCHREC retrieves the records that satisfy the NEXT criteria and stores them in a stack named EMPSTACK. The Winform displays the retrieved records on the grid.
3. The user edits all the necessary leaves taken directly on the Winform grid and then clicks the Update button to invoke case UPDLV, which updates all leaves taken.



The following Winform displays when the GetEmp button (or PF4) is pressed with PROD entered in the Department field:

**Department : PROD**

| EMPLOYEE_ID | LEAVE_DUE | LEAVE_TAKEN |
|-------------|-----------|-------------|
| 11100305    | 31        | 12          |
| 11100308    | 31        | 5           |
| 11100309    | 30        | 28          |
| 11100310    | 30        | 5           |
| 11100311    | 30        | 10          |
| 11100312    | 29        | 28          |
| 11100313    | 30        | 0           |

**GetEmp (PF4)**

**Update (PF6)**

**Exit (PF3)**

The user can update the LEAVE\_TAKEN field for all of the listed employees and update them all in one step with the Update button (or PF6).

## **Adabas Transaction Control Within MODIFY**

The data adapter supports the Logical Unit of Work (LUW) concept. An LUW consists of one or more FOCUS maintenance actions (UPDATE, INCLUDE, or DELETE) that process as a single unit. The maintenance operations within the LUW can operate on the same or separate data sources.

In MODIFY, all records read by MATCH and NEXT commands are held by Adabas in a user's hold record queue. To prevent overflow of this queue, the user should periodically issue the SQL COMMIT WORK command to propagate the changes to the Adabas data source and clear the queue.

In Maintain, records are not held when they are read into a stack. They are held only in response to an updating command.

A transaction is defined as all actions taken since the application first accessed Adabas, last issued an SQL COMMIT WORK in MODIFY or COMMIT command in Maintain, or last issued an SQL ROLLBACK WORK in MODIFY or ROLLBACK command in Maintain.

Within a Logical Unit of Work, Adabas either executes all commands completely, or else it executes none of them. If Adabas detects no errors in any of the commands within the LUW:

- FOCUS issues a COMMIT WORK command. The data adapter issues an ET (End of Transaction) command to Adabas. The changes indicated by the updates within the transaction are recorded in the data source.
- Adabas releases locks on the target data.
- Database changes become available for other tasks.

In response to unsuccessful execution of any command in the transaction, the data adapter:

- Issues a BT (Backout Transaction) command to Adabas. Target data returns to its state prior to the unsuccessful transaction. All changes attempted by the commands in the transaction are backed out.
- Does not execute the remaining commands in the transaction.
- Releases locks on the target data.
- Discards partially accumulated results.

Adabas and the data adapter provide a level of automatic transaction management but, in many cases, this level of management alone is not sufficient. FOCUS supports explicit control of Adabas transactions with the commands SQL COMMIT WORK and SQL ROLLBACK WORK in MODIFY, and with the commands COMMIT and ROLLBACK in Maintain.

**Note:** SQL COMMIT WORK and SQL ROLLBACK WORK are data adapter commands. Do not confuse these commands with the FOCUS COMMIT WORK and ROLLBACK WORK commands that apply to FOCUS databases only. The data adapter ignores COMMIT WORK and ROLLBACK WORK without the SQL qualifier.

Unless you specify SQL COMMIT WORK and/or SQL ROLLBACK WORK in your MODIFY procedure (or COMMIT and/or ROLLBACK in your Maintain procedure), all FOCUS maintenance actions until the END command constitute a single LUW. If the procedure completes successfully, the data adapter automatically transmits an ET command to Adabas, and the changes become permanent. If the procedure terminates abnormally, the data adapter issues a BT command to Adabas, and the database remains untouched. Since locks are not released until the end of the program, a long MODIFY or Maintain procedure that relies on the default, end-of-program ET can interfere with concurrent access to data. In addition:

- You may lose all updates in the event of a system failure.
- You may fill up the hold queue Adabas establishes records locked by a user. The number of ISNs that can be held in this queue is determined by the Adabas NISNHQ parameter. To avoid exceeding this number, keep a counter in your MODIFY or Maintain procedure, and commit or rollback the transaction to avoid holding too many records.

### **Transaction Termination (COMMIT WORK)**

The SQL COMMIT WORK command signals the successful completion of a transaction at the request of the procedure. Execution of a COMMIT command makes changes to the data sources permanent. The syntax in a MODIFY request is:

`SQL COMMIT WORK`

You can issue a COMMIT WORK as an ON MATCH, ON NOMATCH, ON NEXT, or ON NONEXT condition, after an update operation (INCLUDE, UPDATE, DELETE), or within cases of a case logic request.

**Note:** In Maintain, you must use the Maintain facility's COMMIT command to transmit an ET (End of Transaction) command to Adabas.

### Example Using COMMIT WORK in a MODIFY Procedure

A COMMIT WORK example using Case Logic follows:

```
CASE PROCESS
 CRTFORM
 MATCH field1 ...
 ON MATCH insert, update, delete, ...
 GOTO EXACT
ENDCASE
CASE EXACT
 SQL COMMIT WORK
 GOTO TOP
ENDCASE
```

The PROCESS case handles the MATCH, ON MATCH, ON NOMATCH processing. Then it transfers to CASE EXACT, which commits the data instructing Adabas to write the entire Logical Unit of Work to the database.

### Transaction Termination (ROLLBACK WORK)

The SQL ROLLBACK WORK command signals the unsuccessful completion of a transaction at the request of the procedure. Execution of a ROLLBACK command backs out all changes made to the data sources since the last COMMIT command. The syntax in a MODIFY request is:

```
SQL ROLLBACK WORK
```

You can design a MODIFY procedure to issue a ROLLBACK WORK command if you detect an error. For example, if a FOCUS VALIDATE test finds an inaccurate input value, you may choose to exit the transaction, backing out all changes since the last COMMIT. You can issue ROLLBACK WORK as an ON MATCH, ON NOMATCH, ON NEXT, or ON NONEXT condition, or within cases of a case logic request.

**Note:** In Maintain, you must use the Maintain facility's ROLLBACK command to transmit a BT command (Back out Transaction) to Adabas.

The data adapter automatically executes an SQL ROLLBACK WORK command when you exit from a transaction early. For example, if you exit a CRTFORM without specifying some action, the data adapter automatically issues a ROLLBACK WORK command on your behalf.

The data adapter automatically issues a BT command in case of system failure or when it detects a fatal data error, such as a reference to a field or data source that does not exist.

## **Example** Using ROLLBACK WORK in a MODIFY Procedure

The following is an example of the ROLLBACK WORK command using Case Logic:

```
ON NOMATCH CRTFORM ...
ON NOMATCH VALIDATE ...
 ON INVALID GOTO ROLLCASE
 .
 .
 .
CASE ROLLCASE
 SQL ROLLBACK WORK
 GOTO TOP
ENDCASE
```

Code the ROLLBACK WORK command before a REJECT command. FOCUS ignores any action following the rejection of a transaction, except for GOTO or PERFORM.

For example:

```
ON MATCH SQL ROLLBACK WORK
ON MATCH REJECT
```

## **Example** Transaction Control in Adabas

Each time an employee takes leave days, the following example updates the LEAVE\_TAKEN field in the root segment of the EMPWRITE data source and posts a record for the leave start and end dates in the related AW0401 segment. To ensure that both updates complete or neither one does, the MODIFY procedure places both actions prior to a COMMIT WORK command. If the descendant data source is not processed, ROLLBACK WORK discards the whole logical transaction.

```
MODIFY FILE EMPWRITE
CRTFORM LINE 1
"</2 <25 MODIFY FOR LEAVE TAKEN </2 "
"<20 ENTER THE EMPLOYEE ID <EMPLOYEE_ID "
MATCH EMPLOYEE_ID
 ON MATCH CRTFORM LINE 7
 "<D.FIRST_NAME <D.LAST_NAME> LEAVE TAKEN <T.LEAVE_TAKEN> </1 "
 ON MATCH UPDATE LEAVE_TAKEN
 ON MATCH COMPUTE AW0401_OCC =0;
 ON NOMATCH REJECT
MATCH AW0401_OCC
 ON NOMATCH CRTFORM LINE 10
 "PLEASE ENTER LEAVE DATES"
 "LEAVE_START: <T.LEAVE_START> "
 "LEAVE_END: <T.LEAVE_END> "
 ON NOMATCH INCLUDE
 ON NOMATCH SQL COMMIT WORK
 ON MATCH SQL ROLLBACK WORK
 ON MATCH REJECT
DATA
END
```

### Using the Return Code Variable: FOCERROR

FOCUS stores the return code from the updating commands INCLUDE, DELETE, and UPDATE in the variable FOCERROR:

- In MODIFY, the return code value is the Adabas response code.
- In Maintain, the value is
  - 1 if an INCLUDE command failed.
  - 2 if a DELETE command failed.
  - 3 if an UPDATE command failed.



A return code of zero indicates successful completion of the last updating command issued.

You can test the FOCERROR variable and take appropriate action if you encounter a non-fatal error. This condition might indicate the need to ROLLBACK the transaction or re-prompt the user for new input values. In Maintain, all errors after updating commands are non-fatal, and you should always test FOCERROR after issuing an updating command. In MODIFY, you can issue the SQL SET ERRORRUN ON command to make these errors non-fatal. If you do not issue this command, all errors after updating commands in MODIFY will be fatal.

All errors that result from retrieval commands such as MATCH or NEXT are fatal errors. An example of a command that causes a retrieval error is attempting to read a record held by another user. These errors terminate MODIFY and Maintain procedures.

For a list of common Adabas response codes, see [Adabas Response Codes](#).

### Using the Data Adapter SET ERRORRUN Command

With SET ERRORRUN ON, MODIFY processing continues even when a serious error occurs, allowing applications to handle their own errors in the event that an Adabas error is part of the normal application flow. Code this command explicitly within the MODIFY procedure, preferably in CASE AT START, where it executes once.

**Note:** Maintain does not support the SET ERRORRUN command. All errors after updating commands are non-fatal.

When SET ERRORRUN is ON, the MODIFY procedure reports the error but continues execution. The MODIFY code can then test the value of FOCERROR to determine the cause of the error and take appropriate action. Be careful in evaluating the contents of FOCERROR, to prevent unpredictable errors in subsequent MODIFY processing.

SET ERRORRUN returns to its default setting of OFF at the end of the MODIFY procedure.

### **Syntax**    **How to Issue the SET ERRORRUN Command in a MODIFY Procedure**

```
CASE AT START
 SQL SET ERRORRUN {OFF|ON}
ENDCASE
```

where:

**OFF**

Stops MODIFY processing when the Data Adapter detects a fatal error. OFF is the default.

**ON**

Enables MODIFY processing to continue despite fatal errors. Test the value of FOCERROR to determine the desired action after an updating command fails. After the procedure ends, ERRORRUN returns to its default value of OFF.

### **Modifying Data sources Without Unique Keys**

Adabas permits data sources with duplicate records. Such data sources cannot possibly have a unique key, since no combination of field values can make a given record unique.

The data adapter provides a way of maintaining data sources with duplicate records. However, only the first record encountered will be affected by data maintenance commands.

**Note:**

- Maintain does not support modifying unkeyed data sources.

## Referential Integrity

The term *referential integrity* defines the type of consistency that should exist between parent and descendant segments.

- A parent segment must exist before a related record in a lower level segment can exist. For example, a specific employee ID must exist in the EMPWRITE data source before a salary can be added for that employee in the AQ0201 segment (INCLUDE referential integrity).
- If a parent segment is deleted, all of its descendant segments must be deleted (DELETE referential integrity).

FOCUS can provide referential integrity for the following types of data sources described in one multi-segment Master File:

- A single Adabas file.
- Multiple Adabas files connected by an embedded join in the Access File. The segment declarations for all such Adabas files must have ACCESS=ADBS in the Access File and must be joined using the Access File attributes KEYFLD and IXFLD. For more information on embedded joins, see the *FOCUS for IBM Mainframe ADABAS Interface User's Manual and Installation Guide*.

The following sections discuss referential integrity constraints.

## FOCUS INCLUDE Referential Integrity

The FOCUS MODIFY facility syntax provides automatic referential integrity for inserting new records.

You must describe the data source in one multi-segment Master File. The multi-segment description establishes the relationship between the segments.

With a multi-segment Master File, you cannot add a descendant segment using the FOCUS MODIFY facility unless the parent segment already exists.

Therefore, a MODIFY procedure that inserts records must MATCH on the parent segment before adding a record in descendant segment.

### Example Using FOCUS INCLUDE Referential Integrity

The following examples demonstrate referential integrity when adding new records. The scenarios are:

1. Add a salary for an employee *only* if data for the employee ID already exists.
2. The employee ID does not exist. Add both a new employee ID and a salary.

A simple, annotated FOCUS MODIFY procedure for each scenario follows.

The first example adds course information only if a record already exists for the employee:

```
MODIFY FILE EMPWRITE
CRTFORM LINE 2
"ADD SALARY INFORMATION FOR EMPLOYEE </1"
1. "EMPLOYEE ID: <EMPLOYEE_ID </1 "
 "SALARY: <SALARY CURR_CODE: <CURR_CODE "
2. MATCH EMPLOYEE_ID
 ON MATCH COMPUTE AQ0201_OCC = 0;
3. ON MATCH CONTINUE
4. ON NOMATCH REJECT
5. MATCH AQ0201_OCC
 ON NOMATCH INCLUDE
 ON MATCH REJECT
DATA
END
```

The MODIFY procedure processes as follows:

1. The user enters the employee ID, salary, and appropriate code. This constitutes the incoming transaction record.
2. The MATCH command causes Adabas to search the data source for an existing record with the specified employee ID.
3. If the employee record exists, the MODIFY sets the salary occurrence number to zero and continues to the next MATCH command.
4. If no record in the EMPWRITE data source exists with the specified employee ID, MODIFY rejects this transaction and routes control to the top of the procedure.

5. MATCH AQ0201\_OCC causes Adabas to search for an existing salary record with the specified occurrence number for the employee ID located in Step 2. Because the occurrence number was set to zero in the previous MATCH command, no such record exists, and the MODIFY adds a new salary occurrence. If the occurrence number already existed, the MODIFY would reject the transaction as a duplicate.

The second example adds a record to the EMPWRITE data source for a new employee and adds a salary for that employee to the AQ0201 segment. If the employee ID already exists, the procedure adds only the salary information to the AQ0201 segment:

```
MODIFY FILE EMPWRITE
CRTFORM LINE 1
1. "ID: <EMPLOYEE_ID "
2. MATCH EMPLOYEE_ID
3. ON NOMATCH CRTFORM LINE 2
 " LAST: <LAST_NAME FIRST: <FIRST_NAME </1 "
 " MIDDLE: <MIDDLE_NAME> </1 "
 " ADDRESS_LINE_CNT <ADDRESS_LINE_CNT> CITY: <CITY "
 " ZIP: <ZIP_CODE COUNTRY: <COUNTRY </1"
 " DEPT: <DEPT INCOME_CNT: <INCOME_CNT </1"
 "LEAVE DUE: <LEAVE_DUE DEPARTMENT: <DEPARTMENT "
 "SALARY: <SALARY CODE: <CURR_CODE "
 ON NOMATCH INCLUDE
 ON NOMATCH COMPUTE AQ0201_OCC = 0;
 ON MATCH COMPUTE AQ0201_OCC = 0;
4. ON MATCH CRTFORM LINE 9
 "SALARY: <SALARY CODE: <CURR_CODE "R_TAKEN QTR: <QTR "
```

5. MATCH AQ0201\_OCC  
ON NOMATCH INCLUDE  
ON MATCH REJECT  
DATA  
END

The MODIFY procedure processes as follows:

1. The user enters EMPLOYEE\_ID.
2. The MATCH command causes Adabas to search the EMPWRITE data source for an existing record for the specified employee ID.
3. If the employee record does not exist, the user enters the data for both the employee and the salary. The procedure adds a record to each segment.
4. If the employee already exists, the user enters only the salary data.
5. The MATCH AQ0201\_OCC command causes Adabas to search the AQ0201 segment for the specified occurrence. If this occurrence does not exist for this employee, the procedure adds it. If it does exist, the procedure rejects the transaction.

### **FOCUS DELETE Referential Integrity**

FOCUS provides automatic referential integrity for deleting records described in a multi-segment Master File. Just as with INCLUDE referential integrity, only data sources described in a multi-segment Master File invoke FOCUS DELETE referential integrity.

When you delete a parent segment in a MODIFY or Maintain procedure, FOCUS automatically deletes all descendant segments at the same time.

## **Example Using FOCUS DELETE Referential Integrity**

For example, when you delete an employee from the root segment in the EMPWRITE Master File, FOCUS also deletes all records from the descendent segments for the employee:

```
MODIFY FILE EMPWRITE
CRTFORM LINE 2
"DELETE EMPLOYEE </1"
1. "EMPLOYEE ID: <EMPLOYEE_ID "
2. MATCH EMPLOYEE_ID
 ON MATCH COMPUTE DOIT/A1 = 'N';
 ON MATCH CRTFORM LINE 6
3. "EMPLOYEE TO BE DELETED: <D.EMPLOYEE_ID </1"
 " LAST NAME: <D.LAST_NAME </1"
 " FIRST NAME: <D.FIRST_NAME </1"
 " DEPARTMENT: <D.DEPARTMENT </1"
 "IS THIS THE EMPLOYEE YOU WISH TO DELETE? (Y,N): <DOIT "
 ON MATCH IF DOIT EQ 'N' THEN GOTO TOP;
4. ON MATCH DELETE
 ON NOMATCH REJECT
 DATA
 END
```

The MODIFY procedure processes as follows:

1. The user enters the employee ID.
2. The MATCH command causes Adabas to search the root segment of the EMPWRITE data source for an existing record with the specified employee ID.
3. If the record exists, the MODIFY displays information for verification.



4. Once verified, FOCUS deletes the employee and all associated segment instances. When FOCUS deletes a parent instance, it automatically deletes all associated related instances.

### Inhibiting FOCUS Referential Integrity

You may not always want to enforce FOCUS referential integrity. If the referential integrity is being enforced between separate Adabas files described in a single Master File using an embedded join described in the Access File, you can describe each file you want to modify separately in a separate Master File.

Another technique is to COMBINE data sources rather than using a multi-segment Master File. COMBINE of single data sources does not invoke FOCUS referential integrity.

### The MODIFY COMBINE Facility

Some applications require that you use a single input transaction to update several data sources in the same MODIFY procedure. If the data sources are not defined in the same Master File, you can use the COMBINE facility to modify them as if they are one.

**Note:** In Maintain, you do not issue a COMBINE command to modify unrelated data sources. Instead, you reference multiple data sources in the MAINTAIN FILE command. For example:

```
MAINTAIN FILES EMPWRITE AND COURSE
```

You can maintain up to 63 data sources in a single MODIFY procedure that operates on a COMBINE structure. The COMBINE limit is 16 Master Files; however, each Master File can describe more than one data source, for a total of 64 per procedure, minus one for the virtual root segment created by the COMBINE command.

The COMBINE facility links multiple data sources and assigns a new name to them so FOCUS can treat the data sources as a single structure. Data sources in a COMBINE structure can have different SUFFIX attributes, but you cannot combine a FOCUS database with anything except other FOCUS databases.

**Note:** In Maintain, you can modify FOCUS databases and Adabas data sources in the same procedure.

When you issue a COMBINE command, the COMBINE structure remains in effect for the duration of the FOCUS session or until you enter another COMBINE command. Only one COMBINE structure can exist at a time, so each subsequent COMBINE command replaces the existing structure.

Do not confuse COMBINE with the dynamic JOIN command. You use JOIN to *report* from multiple data sources that share at least one common field or for LOOKUP functions. With the COMBINE facility, you can *MODIFY* multiple data sources. COMBINE is part of the MODIFY command; only the MODIFY and CHECK FILE commands process COMBINE structures. The FIND function also works in conjunction with COMBINE (see [The FIND Function](#)).

Note that COMBINE considers the component structures to be unrelated. FOCUS referential integrity does not apply to a COMBINE of single-data source Master Files. Your procedure should check for and enforce referential integrity, if necessary.

## Syntax    How to Use the COMBINE Command

The basic syntax for the COMBINE command is

```
COMBINE FILES file1 [PREFIX pref1|TAG tag1] [AND]
.
.
.
 filen [PREFIX prefn|TAG tagn] AS asname
```

where:

*file1* - *filen*

Are the Master File names of the data sources you want to modify. You can specify up to 16 Master Files.

*pref1* - *prefn*

Are prefix strings for each file; up to four characters. They provide uniqueness for fieldnames. You cannot mix TAG and PREFIX in a COMBINE structure. Refer to the FOCUS for S/390 documentation for additional information.

*tag1* - *tagn*

Are aliases for the data source names; up to eight characters. FOCUS uses the tag name as a qualifier for fields that refer to that data source in the combined structure. You cannot mix TAG and PREFIX in a COMBINE, and you can only use TAG if FIELDNAME is set to NEW or NOTRUNC.

AND

Is an optional word to enhance readability.

*asname*

Is the required name of the combined structure to use in MODIFY procedures and CHECK FILE commands.

Once you enter the COMBINE command, you can modify the combined structure.

### How FOCUS Creates a COMBINE Structure

For example, the EMPINFO data source contains employee number, last name, first name, hire date, department code, current job code, current salary, number of education hours, and bonus plan information. A second data source, PAYINFO, is a historical record of the employee's pay history. It contains the employee number, date of increase, percent of increase, new salary, and job code.

Each time a salary changes, both the EMPINFO and PAYINFO data sources must reflect the change. Since both data sources need to share data entered for employee number, salary and job code, this application is appropriate for the COMBINE facility. You can update both data sources at the same time without having to define multi-segment Master and Access Files.

The following figures represent the data sources as separate entities.

EMPINFO data source

```
 EMPINFO
01 S0

*EMPLOYEE_ID **
*LAST_NAME **
*FIRST_NAME **
*HIRE_DATE **
* **

 EMPINFO
```

PAYINFO data source

```
 PAYINFO
01 S0

*PAYEID **
*DAT_INC **
*PCT_INC **
*SALARY **
* **

 PAYINFO
```

To modify the data sources simultaneously, issue the following sequence of commands at the FOCUS command level or in a FOCEXEC:

```
COMBINE FILES EMPINFO PAYINFO AS EMPSPAY
MODIFY FILE EMPSPAY
```

```
.
. .
.
```

In the following picture, generated by the CHECK FILE command, FOCUS defines a new segment, identified as SYSTEM99, to be the root segment of the combined structure.

SYSTEM99 acts as the traffic controller for this structure; it is a virtual (artificial) segment. It counts as one segment towards the total of 64 segments allowed in the COMBINE structure.

check file empspay pict

NUMBER OF ERRORS= 0  
NUMBER OF SEGMENTS= 3 ( REAL= 3 VIRTUAL= 0 )  
NUMBER OF FIELDS= 15 INDEXES= 0 FILES= 3  
TOTAL LENGTH OF ALL FIELDS= 95

SECTION 01

STRUCTURE OF SQLDS FILE EMPINFO ON 07/22/93 AT 09.54.27

SYSTEM99

01 S0

\*\*\*\*\*

\* \*\*  
\* \*\*  
\* \*\*  
\* \*\*  
\* \*\*

\*\*\*\*\*

\*\*\*\*\*

I

+-----+

I

I

I EMPINFO

I PAYINFO

02 I S0

03 I S0

\*\*\*\*\*

\*\*\*\*\*

|                 |             |
|-----------------|-------------|
| *EMPLOYEE_ID ** | *PAYEID **  |
| *LAST_NAME **   | *DAT_INC ** |
| *FIRST_NAME **  | *PCT_INC ** |
| *HIRE_DATE **   | *SALARY **  |
| * **            | * **        |

\*\*\*\*\*

\*\*\*\*\*

\*\*\*\*\*

\*\*\*\*\*

EMPINFO

PAYINFO

The COMBINE facility makes it easy to modify many files with the same transaction. For additional information regarding the COMBINE facility of MODIFY, refer to the *Maintaining Databases* manual.

### The LOOKUP Function

The LOOKUP function, used in FOCUS MODIFY procedures, retrieves data values from cross-referenced data sources joined dynamically with the JOIN command. The function is valid in both MODIFY COMPUTE and VALIDATE commands.

The syntax for the LOOKUP function is

```
rfield/I1 = LOOKUP(field);
```

where:

*rfield*

Contains the return code (1 or 0) after the LOOKUP function executes.

*field*

Is the name of any field in a cross-referenced data source. After the LOOKUP, this fieldname contains the field's value for you to use as needed.

To use this feature most efficiently with Adabas, specify a cross-referenced field for which an Adabas descriptor has been established.

#### Note:

- The LOOKUP function is not supported between Adabas data sources and FOCUS databases in either direction.

- The extended syntax of the LOOKUP function (parameters GE and LE) is not valid for Adabas data sources. LOOKUP can only retrieve values that match exactly. Refer to the FOCUS for S/390 documentation for more information.

## The FIND Function

The FIND function, used with COMBINE structures in FOCUS MODIFY procedures or with any file in a Maintain procedure, verifies the existence of a value in another data source. The FIND function sets a temporary field to 1 if the value exists in the other data source and to 0 if it does not. FIND does not return any actual data values.

Use FIND only with a data source referenced in a COMBINE command or a MAINTAIN FILE command. With COMBINE, if the FIND is for a field in a VSAM file, this field must be the index or alternate index field. For Maintain, the field must be indexed only if it is in a FOCUS database.

The syntax for the FIND function is

```
rfield/I1 = FIND(fieldname AS dbfield IN file);
```

where:

*rfield*

Contains the return code (1 or 0) after the FIND function executes.

*fieldname*

Is the comparison field from one COMBINE data source or one data source referenced in a MAINTAIN FILE command.



### *dbfield*

For MODIFY, is the field in another COMBINE file structure or an indexed field in a VSAM file, to use for the value comparison. The AS dbfield clause is optional if rfield and dbfield have the same name.

For Maintain, is a fieldname from one of the files listed in the MAINTAIN FILE command, qualified with its file name.

To use this feature most efficiently with Adabas, specify a field for which an Adabas descriptor has been established.

### *file*

In MODIFY, names the data source or VSAM file in which dbfield resides. In Maintain, is ignored.

The FIND function is only supported within MODIFY or Maintain procedures. For more information, consult the FOCUS for S/390 documentation.

## Data Adapter Error Messages and Adabas Response Codes

This section lists the Adabas Write Data Adapter error messages and common Adabas response codes.

### Adabas Write Data Adapter Error Messages

In the following error messages, the term *number* refers to the response code that Adabas returns. For example, the following message references Adabas error response code 113 in the Adabas Messages and Codes manual:

(FOC4561)            ERROR IN ADABAS INCLUDE/113

The following messages apply to the Adabas Write Data Adapter:

(FOC4555)            INVALID UNQKEYNAME FOR SEGMENT

|           |                                                     |
|-----------|-----------------------------------------------------|
| (FOC4557) | ERROR IN ADABAS COMMIT/ <i>number</i>               |
| (FOC4558) | ERROR IN ADABAS ROLLBACK/ <i>number</i>             |
| (FOC4559) | ERROR IN ADABAS UPDATE/ <i>number</i>               |
| (FOC4560) | ERROR IN ADABAS DELETE/ <i>number</i>               |
| (FOC4561) | ERROR IN ADABAS INCLUDE/ <i>number</i>              |
| (FOC4562) | RECORD IS HELD BY ANOTHER USER                      |
| (FOC4563) | INCORRECT INCLUDE REQUEST FOR NON UNIQUE KEY        |
| (FOC4564) | THIS OCCURRENCE ALREADY EXISTS. USE UPDATE COMMAND. |
| (FOC4565) | IGNORED ATTEMPT TO CHANGE NONUPDATABLE FIELD        |

An UPDATE command was used against a nonupdatable field,  
i.e. - field described in AFD as SUB/SUPERDESCRIPTOR or part  
of it;  
- field that refers in MFD to the same DB field (ALIAS) as another  
field (synonym case).

For individual Adabas Data Adapter error messages, consult Appendix B,  
*Adabas Interface Error Messages* in the FOCUS for IBM Mainframe Adabas  
Interface User's Manual and Installation Guide.

**Adabas Response Codes**

If variables FOCERROR or RETCODE have the value 999, the Adabas

| <b>FOCUS Error</b> | <b>Adabas Response Code</b> | <b>Description</b>                                                                                                                        |
|--------------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| FOC4490            | 148                         | The database is down or unavailable.                                                                                                      |
| FOC4496            | 148                         | Check the DBNO in the Access File.                                                                                                        |
| FOC4500            | 113                         | The FILENO for the segment in the Access File is not correct.                                                                             |
| FOC4504            | 0                           | Check the DBNO and FILENO in both the PREDDDB and PREDEL Access Files.                                                                    |
| FOC4504            | 17                          | The database contains no data and/or the database does not exist in the Predict dictionary.                                               |
| FOC4504            | 28                          | Check the compatibility of the Predict dictionary and FDT listing.                                                                        |
| FOC4504            | 41                          | The Predict dictionary and FDT may not match. Check the group in the FDT. It may have been created differently in the Predict dictionary. |
| FOC4504            | 201                         | The password is not correct.                                                                                                              |

| <b>FOCUS Error</b> | <b>Adabas Response Code</b> | <b>Description</b>                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Any                | 9                           | <p>As a rule:<br/>The transaction time limit (TT) or the transaction non-activity time limit (TNAE, TNAX, TNAA) has been exceeded.</p> <p>For details see a subcode value in the Adabas control block's ADD2 field in the data adapter's level 3 trace, and refer to its explanation in the Adabas <i>Messages and Codes</i> manual.</p> |
| Any                | 47                          | <p>The maximum value for the NISNHQ parameter was exceeded.</p> <p>Too many records are held. You can release them by periodically issuing the COMMIT command.</p>                                                                                                                                                                       |
| Any                | 40-45                       | <p>One or more errors occurred in the Format Buffer.</p> <p>There is a discrepancy between the Master File and the Adabas FDT.</p>                                                                                                                                                                                                       |

| FOCUS Error | Adabas Response Code | Description                                                                                                                 |
|-------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Any         | 50-59                | One or more errors occurred in the Record Buffer.<br><br>There is a discrepancy between the Master File and the Adabas FDT. |
| Any         | 145                  | An attempt was made to hold a record already in the hold queue for another user.                                            |

response code was not used. Use the data adapter error message to determine the cause of the error.

For details on the Adabas response codes that may accompany the Adabas Data Adapter error messages, see your Software AG publication, *General Reference Set: Messages and Codes Manual*. If a subcode details the specific cause and actions for the response code in this manual, you can find the subcode's value in the low-order (rightmost) two bytes of the Adabas control block's ADD2 field using the Adabas Data Adapter's level 3 trace. The trace facility for the Write data adapter is the same as for the Read data adapter.

## Common User Errors

1. Using a group field in an INCLUDE or UPDATE command.

In the following request, the record is not inserted because the field list contains a group field (LEAVE\_DATA):

```
MODIFY FILE EMPWRITE
-* This is an example of the error caused by using a
-* group field (LEAVE_DATA), rather than only elementary fields,
-* in an INCLUDE process.
-* The insert (Segname=S01) is rejected with the error -
-* (FOC4491) FIND ERROR READING FIRST RECORD : S01 /61
-*
-* Insert for SEGNAME=S01 - ACCESS=ADBS
 COMPUTE EMPLOYEE_ID = 'EMPID003';
 MATCH EMPLOYEE_ID
 ON MATCH COMPUTE
 LAST_NAME = 'SMITH' ;
 FIRST_NAME = 'ROBERT' ;
 MIDDLE_NAME = 'EDWARD' ;
 CITY = 'NEW YORK' ;
 ZIP_CODE = '10121' ;
 COUNTRY = 'USA' ;
 LEAVE_DATA = 'VAC0801080700';
 ON MATCH INCLUDE
 ON NOMATCH REJECT
DATA
END
```

**Solution:** Use only elementary fields in the field list for INCLUDE and UPDATE.

2. Issuing an INCLUDE command for a new key value with additional fields in the MATCH list.

In the following example EMPLOYEE\_ID is defined as a unique key in the Access File. However, Adabas may insert the record even if the employee ID value already exists in the data source:

```
MODIFY FILE EMPWRITE

- * INSERT FOR SEGNAM=S01 - ACCESS=ADBS
 COMPUTE EMPLOYEE_ID = 'EMPID001';
 LAST_NAME = 'SMITH';
 MATCH EMPLOYEE_ID LAST_NAME
 ON NOMATCH COMPUTE
 FIRST_NAME = 'ROBERT';
 MNAME = 'EDWARD';
 CITY = 'NEW YORK';
 ON NOMATCH INCLUDE
 ON MATCH REJECT
DATA
END
```

**Solution:** Issue the MATCH command for the field EMPLOYEE\_ID alone, then enter values into the other fields and issue the INCLUDE command.

## 7.0.9 New Features

### Fusion

[NF575: Fusion](#)

### General Enhancements

[NF716: Euro Currency Support](#)

[NF655: FOCPROF - The System Wide Profile](#)

[NF735: Enhancement to ? SET](#)

[NF746: Leading Zeros](#)

[NF656: Controlling REBUILD Messages](#)

[NF740: Changes to the REBUILD Prompt](#)

[NF660: Multi-volume Support in MVS FOCUS](#)

[NF670: DYNAM Support for Unit Count](#)

[NF718: DYNAM Support for Existing Relative GDG  
Numbers](#)

[NF745: ? PTF Enhancements](#)

### Reporting Enhancements

[NF691: Escape Character for LIKE Predicate](#)

[NF744: HOLD FORMAT EXCEL](#)

[NF748: HOLD FORMAT WP With Carriage Control](#)



## **Performance Enhancements**

**[NF654: HOLD From External Sort](#)**

**[NF597: Aggregation by External Sort](#)**

**[NF728: Changing Retrieval Order with Aggregation](#)**

## **Web Interface for FOCUS**

**[NF683: Web Interface Support for Maintain Winforms](#)**

**[NF684: PCHOLD for Non-Html Files](#)**

**[NF730: Hold Format PDF](#)**

## **Relational Interfaces**

**[NF720: SQLJOIN OUTER Setting for Relational Interfaces](#)**

## **Teradata Interface**

**[NF652: Teradata Interface Kanji Support](#)**

## **Model 204 Interface**

**[NF673: Model 204 Interface Account Split](#)**

## **CA-IDMS Interface**

**[NF584: Dynamically Setting the IDMS DBNAME and  
DICTNAME](#)**

## **FOCUS Client**

**[NF722: FOCUS Client DNS Names Support](#)**

## NF575: Fusion

FOCUS Version 7.0 release 9 introduces the Fusion database for CMS and MVS FOCUS. Fusion is a high performance database whose unique Multi Dimensional Indexing (MDI) architecture extends the scope of high-speed multi-dimensional query performance.

For complete details, see the *Fusion User's Manual for EDA 4.2 and FOCUS 7.0* (DN3700041.1198).

## NF716: Euro Currency Support

With the introduction of the euro currency, businesses need to maintain books in two currencies, add new fields to their database designs, and perform new types of currency conversions. This new feature gives FOCUS the ability to perform currency conversions according to the rules specified by the European Union. Before you can use FOCUS to process currency conversions, you must:

- Create a currency database with the currency IDs and exchange rates you will use. See [Creating the Currency Database](#).
- Identify fields in your data sources that represent currency data. See [Identifying Fields That Contain Currency Data](#).
- Activate your currency database. See [Activating the Currency Database](#).

After you complete these preliminary steps, you can perform currency conversions. See [Processing Currency Data](#).

**Note:** Operating system vendors are in the process of integrating the euro currency symbol into their environments. As the euro symbol becomes available, FOCUS will support it.

### Converting Currencies

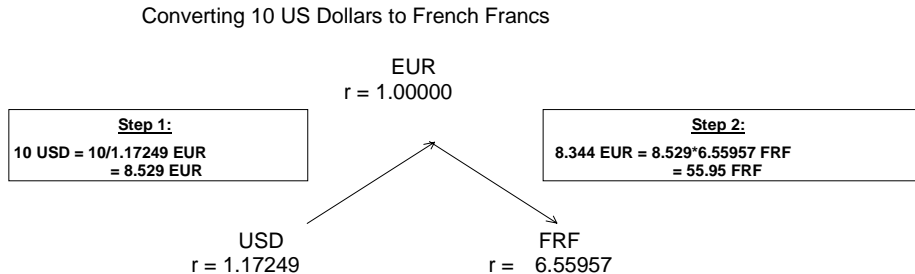
Although the euro was introduced in 11 countries of the European Union on January 1, 1999, it will not immediately replace local currencies in those countries. During the transition period from 1999 to 2002, both traditional currencies and the euro will be used simultaneously for accounting purposes and non-cash transactions in each participating country. Euro cash will not be introduced until January 1, 2002, and by July 1, 2002 the traditional currencies will no longer be legal tender.

On the last day of 1998, the European Union set fixed exchange rates between the euro and the traditional national currency in each of the 11 adopting member nations. While the exchange rates within “Euroland” will remain fixed, exchange rates between the euro and non-euro countries will continue to vary freely and, in fact, several rates may be in use at one time (for example, actual and budgeted rates).

The European Union has established the following rules for currency conversion:

- The exchange rate must be specified as a decimal value,  $r$ , with six significant digits (not six decimal places). For example, 123.456 has six significant digits but not six decimal places. This rate will establish the following relationship between the euro and the particular national currency:  
$$1 \text{ euro} = r \text{ national units}$$
- To convert from the euro to the national unit, multiply by  $r$  and round the result to two decimal places.
- To convert from the national currency to the euro, divide by  $r$  and round the result to two decimal places.

- To convert from one national currency to another, first convert from one national unit to the euro, rounding the result to at least three decimal places (FOCUS rounds to exactly three decimal places). Then convert from the euro to the second national unit, rounding the result to two decimal places. The following diagram illustrates this two-step conversion process known as *triangulation*:



## Preparing FOCUS to Process Currency Conversions

Although 11 or more currencies in the European Union will be converting to the euro, more than 100 currencies have a recognized status worldwide. In addition, you may need to define custom currencies for some applications.

You identify your currency codes and rates by creating a currency database. The currency database can be any type of data source that FOCUS can access.

### Creating the Currency Database

For each type of currency you need, you must supply the following values in your currency database:

- A three-character code to identify the currency, such as USD for U.S. dollars or BEF for Belgian francs. (For a partial list of recognized currency codes, see [Sample Currency Codes](#).)
- One or more exchange rates for the currency.

There is no limit to the number of currencies you can add to your currency database; the currencies you can define are not limited to official currencies and, therefore, the currency database can be fully customized for your applications.

We strongly recommend that you create a separate database for the currency data rather than adding the currency fields to another data source. A separate currency database enhances performance and minimizes resource utilization because FOCUS loads the currency database into memory before you perform currency conversions.

### Syntax    How to Specify Currency Codes and Rates in a Master File

The currency database can be any type of data source accessible by FOCUS (for example, FOCUS, FIX, DB2, or VSAM). The currency Master File must have one field that identifies each currency ID you will use and one or more fields to specify the exchange rates.

The syntax is

```
FIELD = CURRENCY_ID, FORMAT = A3, ACTUAL = A3 ,$
FIELD = rate1, FORMAT = {D12.6|numeric_format1}, ACTUAL = A12,$
.
.
.
FIELD = raten, FORMAT = {D12.6|numeric_formatn}, ACTUAL = A12,$
```

where:

**CURRENCY\_ID**

Is the required field name. The values stored in this field are the three-character codes that identify each currency, such as USD for U.S. dollars. Each currency ID can be a universally recognized code or a user-defined code. **Note:** FOCUS automatically recognizes the code EUR; you should *not* store this code in your currency database. See [Sample Currency Codes](#) for a list of common currency codes.

**rate1,...,raten**

Are types of rates (such as BUDGET, FASB, ACTUAL) to be used in currency conversions. Each rate is the number of national units that represent one euro.

**numeric\_format1,...,numeric\_formatn**

Are the display formats for the exchange rates. Each format must be numeric. The recommended format, D12.6, ensures that the rate is expressed with six significant digits as required by the European Union conversion rules. Do not use Integer format (I).

**ACTUAL An**

Is required only for non-FOCUS data sources.

**Note:** The maximum number of fields in the currency database must not exceed 255 (that is, the CURRENCY\_ID field plus 254 currency conversion fields).

### **Example Specifying Currency Codes and Rates in a Master File**

The following Master File for a comma-delimited currency database specifies two rates for each currency, ACTUAL and BUDGET:

```
FILE = CURRCODE, SUFFIX = COM,$
FIELD = CURRENCY_ID, FORMAT = A3, ACTUAL = A3 , $
FIELD = ACTUAL, ALIAS = , FORMAT = D12.6, ACTUAL = A12 , $
FIELD = BUDGET, ALIAS = , FORMAT = D12.6, ACTUAL = A12 , $
```

The following is sample data for the currency database defined by this Master File:

```
FRF, 6.55957, 6.50000,$
USD, 1.17249, 1.20000,$
BEF, 40.3399, 41.00000,$
```

### **Identifying Fields That Contain Currency Data**

Once you have created your currency database, you must identify the fields in your data sources that represent currency values. To designate a field as a currency-denominated value (a value that represents a number of units in a specific type of currency) add the CURRENCY attribute to one of the following:

- The FIELD specification in the Master File.
- The left side of a DEFINE or COMPUTE.



### Syntax    How to Identify a Currency Value

Use the following syntax to identify a currency-denominated value:

- In a Master File

```
FIELD = currfield, FORMAT = numeric_format, ,
CURR = {curr_id|codefield} , $
```

- In a DEFINE in the Master File

```
DEFINE currfield/numeric_format CURR curr_id = expression ; $
```

- In a DEFINE FILE command

```
DEFINE FILE filename
currfield/numeric_format CURR curr_id = expression ;
END
```

- In a COMPUTE command

```
COMPUTE currfield/numeric_format CURR curr_id = expression ;
```

where:

*filename*

Is the name of the file for which this field is defined.

*currfield*

Is the name of the currency-denominated field.

*numeric\_format*

Is a numeric format. Depending on the currency denomination involved, the recommended number of decimal places is either two or zero. Do not use I or F format.

*CURR*

Indicates that the field value represents a currency-denominated value. CURR is an abbreviation of CURRENCY, which is the full attribute name.

### *curr\_id*

Is the three-character currency ID associated with the field. In order to perform currency conversions, this ID must either be the value EUR or match a CURRENCY\_ID value in your currency database.

### *codefield*

Is the name of a field, qualified if necessary, that contains the currency ID associated with *currfield*. The code field should have format A3 or longer and is interpreted as containing the currency ID value in its first three bytes.

For example:

```
FIELD = PRICE, FORMAT = P12.2C, ..., CURR = TABLE.FLD1,$
.
.
.
FIELD = FLD1, FORMAT = A3, ..., $
```

The field named FLD1 contains the currency ID for the field named PRICE.

### *expression*

Is a valid expression.

## Example Identifying a Currency-denominated Field

Assume that the currency database contains the currency ID value BEF (Belgian francs).

If the FINANCE data source contains a field named PRICE that is denominated in Belgian francs, the description of PRICE in the FINANCE Master File could be:

```
FIELD = PRICE, ALIAS=, FORMAT = P17.2, CURR=BEF,$
```

## Activating the Currency Database

Before you can perform currency conversions, you must bring the relevant currency database into memory by issuing the SET EUROFILE command.

### Syntax    How to Activate Your Currency Database

Issue the following command at the FOCUS command prompt, in a FOCEXEC, or in any supported profile

```
SET EUROFILE = {ddname|OFF}
```

where:

*ddname*

Is the name of the Master File for the currency database. There is no default value for EUROFILE. The *ddname* must refer to a data source known to FOCUS and accessible by FOCUS in read-only mode.

OFF

Deactivates the currency database and removes it from memory.

During your FOCUS session, if you want to access a different currency database, you can re-issue the SET EUROFILE command.

#### Note:

- You cannot append any additional SET parameters to the SET EUROFILE command line. For example, the PAUSE setting would be lost if you issued the following command:  

```
SET EUROFILE=filename , PAUSE=OFF
```
- You cannot issue the SET EUROFILE command within a TABLE request.

### Syntax How to Determine the Currency Database in Effect

If you want to determine which currency database is in effect, issue the ? SET ALL command or the new EUROFILE query command:

```
? SET EUROFILE
```

### Example Determining the Currency Database in Effect

Assume the currency database is named CURRCODE.

If you issue the following commands:

```
set eurofile = currcode
? set eurofile
```

FOCUS returns the following response:

```
EUROFILE CURRCODE
```

### Reference SET EUROFILE Error Messages and Notes

Issuing the SET EUROFILE command when the currency database Master File does not exist generates the following error message:

```
(FOC205) THE DESCRIPTION CANNOT BE FOUND FOR FILE NAMED: ddname
```

Issuing the SET EUROFILE command when the currency Master File specifies a FOCUS database and the associated FOCUS database does not exist generates the following error message:

```
(FOC036) NO DATA FOUND FOR THE FOCUS FILE NAMED: name
```

**Note for Pooled Table users:** The SET EUROFILE command creates a pool boundary.

## Processing Currency Data

After you have created your currency database, identified the currency-denominated fields in your data sources, and activated your currency database, you can perform currency conversions.

Each currency ID in your currency database generates a virtual conversion function whose name is the same as its currency ID. For example, if you added BEF to your currency database, a virtual BEF currency conversion function will be generated.

The euro function, EUR, is supplied automatically with FOCUS. You do not need to add the EUR currency ID to your currency database.

### Syntax    How to Convert Currency Data

Use the following syntax for calling a currency conversion function

- In a TABLE, GRAPH, or MODIFY procedure:

```
DEFINE FILE filename
result/format [CURR curr_id] = curr_id(infield, rate1 [,rate2]);
END
```

or

```
COMPUTE result/format [CURR curr_id] = curr_id(infield, rate1
[,rate2]);
```

- In a Master File:

```
DEFINE result/format [CURR curr_id] = curr_id(infield, rate1
[,rate2]);$
```

where:

### *filename*

Is the name of the file for which this field is defined.

### *result*

Is the converted currency value.

### *format*

Must be a numeric format. Depending on the currency denomination involved, the recommended number of decimal places is either two or zero. Do not use I or F format. The result will always be rounded to two decimal places, which will display if the format allows at least two decimal places.

### *curr\_id*

Is the currency ID of the result field. This ID must be the value EUR or match a currency ID in your currency database; any other value generates the following message

(FOC263) EXTERNAL FUNCTION OR LOAD MODULE NOT FOUND: *curr\_id*

**Note:** The CURR attribute on the left side of the DEFINE or COMPUTE identifies the result field as a currency-denominated value which can be passed as an argument to a currency function in subsequent currency calculations. Adding this attribute to the left side of the DEFINE or COMPUTE does not invoke any format or value conversion on the calculated result.

### *infield*

Is a currency-denominated value. This input value will be converted from its original currency to the *curr\_id* denomination. If the *infield* and *result* currencies are the same, no calculation is performed and the *result* value is the same as the *infield* value.

### *rate1*

Is the name of a rate field from the currency database. The *infield* value is divided by its currency's *rate1* value to produce the equivalent number of euros.

If *rate2* is not specified in the currency calculation and triangulation is required, this intermediate result is then multiplied by the *result* currency's *rate1* value to complete the conversion.

In certain cases, you may need to provide different rates for special purposes. In these situations you can specify any field or numeric constant for *rate1* as long as it indicates the number of units of the *infield* currency denomination that equals one euro.

### *rate2*

Is the name of a rate field from the currency database. This argument is only used for those cases of triangulation in which you need to specify different rate fields for the *infield* and *result* currencies. It is ignored if the euro is one of the currencies involved in the calculation.

The number of euros that was derived using *rate1* is multiplied by the *result* currency's *rate2* value to complete the conversion.

In certain cases, you may need to provide different rates for special purposes. In these situations you can specify any field or numeric constant for *rate2* as long as it indicates the number of units of the *result* currency denomination that equals one euro.

**Note:** MAINTAIN does not support these currency conversion functions.

### Example Converting Currencies

Assume that the currency database contains the currency IDs USD and BEF, and that PRICE is denominated in Belgian francs as follows:

```
FIELD = PRICE, ALIAS=, FORMAT = P17.2, CURR=BEF,$
```

- The following example converts PRICE to euros and stores the result in PRICE2 using the BUDGET conversion rate for the BEF currency ID:

```
COMPUTE PRICE2/P17.2 CURR EUR = EUR(PRICE, BUDGET);
```

- This example converts PRICE from Belgian francs to US dollars using the triangulation rule:

```
DEFINE PRICE3/P17.2 CURR USD = USD(PRICE, ACTUAL);$
```

First PRICE is divided by the ACTUAL rate for Belgian francs to derive the number of euros rounded to three decimal places. Then this intermediate value is multiplied by the ACTUAL rate for US dollars and rounded to two decimal places.

- The following example uses a numeric constant for the conversion rate:

```
DEFINE PRICE4/P17.2 CURR EUR = EUR(PRICE,5);$
```

- The next example uses the ACTUAL rate for Belgian francs in the division and the BUDGET rate for US dollars in the multiplication:

```
DEFINE PRICE5/P17.2 CURR USD = USD(PRICE, ACTUAL, BUDGET);$
```

### Reference Currency Calculation Processing and Messages

The result is always calculated with very high precision, 31 to 36 significant digits, depending on platform. The precision of the final result is always rounded to two decimal places. In order to display the result to the proper precision, its format must allow at least two decimal places.



Issuing a TABLE request against a Master File that specifies a currency code not listed in the active currency database generates the following message:

(FOC1911) CURRENCY IN FILE DESCRIPTION NOT FOUND IN DATA

A syntax error or undefined fieldname in a currency conversion expression generates the following message:

(FOC1912) ERROR IN PARSING CURRENCY STATEMENT

## Reference Sample Currency Codes

The following rates were in effect on December 31, 1998. Euroland countries as of that date are marked with an asterisk (\*). Their rates are fixed and will not change; the rates for other countries can change over time:

| Country        | Currency Code | Rate    |
|----------------|---------------|---------|
| Austria*       | ATS           | 13.7603 |
| Belgium*       | BEF           | 40.3399 |
| Canada         | CAD           | 1.7978  |
| Denmark        | DKK           | 7.46215 |
| European Union | EUR           | 1       |
| Finland*       | FIM           | 5.94573 |
| France*        | FRF           | 6.55957 |
| Germany*       | DEM           | 1.95583 |

| <b>Country</b> | <b>Currency Code</b> | <b>Rate</b> |
|----------------|----------------------|-------------|
| Greece         | GRD                  | 328.6       |
| Ireland*       | IEP                  | 0.787564    |
| Italy*         | ITL                  | 1936.27     |
| Japan          | JPY                  | 133.149     |
| Luxembourg*    | LUF                  | 40.3399     |
| Netherlands*   | NLG                  | 2.20371     |
| Norway         | NOK                  | 8.91039     |
| Portugal*      | PTE                  | 200.482     |
| Spain*         | ESP                  | 166.386     |
| Sweden         | SEK                  | 9.52669     |
| Switzerland    | CHF                  | 1.61093     |
| UK             | GBP                  | 0.706739    |
| USA            | USD                  | 1.17249     |

## **Example Converting U.S. Dollars to Euros, French Francs, and Belgian Francs**

Assume PRICE is denominated in U.S. dollars and ACTUAL is the name of a rate in the currency database. Using the currency conversion rates from [Sample Currency Codes](#), the following FOCEXEC converts PRICE to euros, French francs, and Belgian francs:

```
-* CURRCODE IS THE CURRENCY DATABASE
-* CURRDATA IS THE DATA SOURCE WITH CURRENCY-DENOMINATED FIELDS

-* THE FOLLOWING FILEDEFS ARE FOR RUNNING UNDER CMS
CMS FILEDEF CURRCODE DISK CURRCODE TEXT A
CMS FILEDEF CURRDATA DISK CURRDATA TEXT A

-* THE FOLLOWING ALLOCATIONS ARE FOR RUNNING UNDER MVS
-* DYNAM ALLOC FILE CURRCODE DA USER1.FOCEXEC.DATA(CURRCODE) SHR REU
-* DYNAM ALLOC FILE CURRDATA DA USER1.FOCEXEC.DATA(CURRDATA) SHR REU

SET EUROFILE = CURRCODE

DEFINE FILE CURRDATA
PRICEUR/P17.2 CURR EUR = EUR(PRICE, ACTUAL);
END

TABLE FILE CURRDATA
PRINT PRICE PRICEUR AND COMPUTE
PRICEFRF/P17.2 CURR FRF = FRF(PRICE, ACTUAL);
PRICEBEF/P17.2 CURR BEF = BEF(PRICE, ACTUAL);
END
```

This request generates the following report:

PAGE 1

| PRICE | PRICEEUR | PRICEFRF | PRICEBEF |
|-------|----------|----------|----------|
| ----- | -----    | -----    | -----    |
| 5.00  | 4.26     | 27.97    | 172.01   |
| 6.00  | 5.12     | 33.57    | 206.42   |
| 40.00 | 34.12    | 223.78   | 1376.20  |
| 10.00 | 8.53     | 55.95    | 344.06   |

**Note:** You cannot use the derived euro value PRICEEUR in a conversion from USD to BEF. PRICEEUR has two decimal places (P17.2), not three, as the triangulation rules require. Therefore, PRICEEUR yields the following inaccurate result (see PRICEBEF above) and is not valid as the intermediate value in a currency conversion that requires triangulation:

```
COMPUTE PRICENew/P17.2 CURR BEF = BEF(PRICEEUR, ACTUAL);
PRICENew

171.85
206.54
1376.40
344.10
```

## NF744: HOLD FORMAT EXCEL

FOCUS can now format report output as a Microsoft® Excel spreadsheet. When you use the HOLD FORMAT EXCEL syntax, FOCUS creates a binary file containing all columns of the report output with their column headings.

If you are using the Web Interface for FOCUS, the Excel spreadsheet can be downloaded automatically to your Web Browser. If you do not have the Web Interface, you can transfer the spreadsheet file to any environment that supports Excel, such as a PC running Microsoft Windows®; the recommended transfer protocol is FTP in binary mode.

You can also store the Excel file on a web server where users can display it using any browser configured with Excel as a plug-in.

### Syntax    How to Create an Excel Spreadsheet

The syntax is.

```
[ON TABLE] HOLD [AS filename] FORMAT EXCEL
```

where:

*ON TABLE*

Is required syntax if you create the Excel file within a report request.

*filename*

Assigns a name to the Hold file. The default name is HOLD.

In MVS, unless you allocate this ddname to a permanent file, FOCUS allocates it to a temporary data set.

In CMS, this name becomes the file name. The file type is XLS.

By default, the extension for Microsoft Excel files is .xls in environments that support file names with extensions. Therefore, the file name after transfer is filename.xls.

### **Syntax**    How to Create and Download an Excel File With the Web Interface for FOCUS

If you are using the Web Interface for FOCUS, you can create the Excel spreadsheet and automatically download it to your Web Browser with the following syntax:

```
[ON TABLE] PCHOLD FORMAT EXCEL
```

where:

`ON TABLE`

Is required syntax if you create the Excel file within a report request.

On the PC, the name of the Excel spreadsheet file is *hold.xls*.

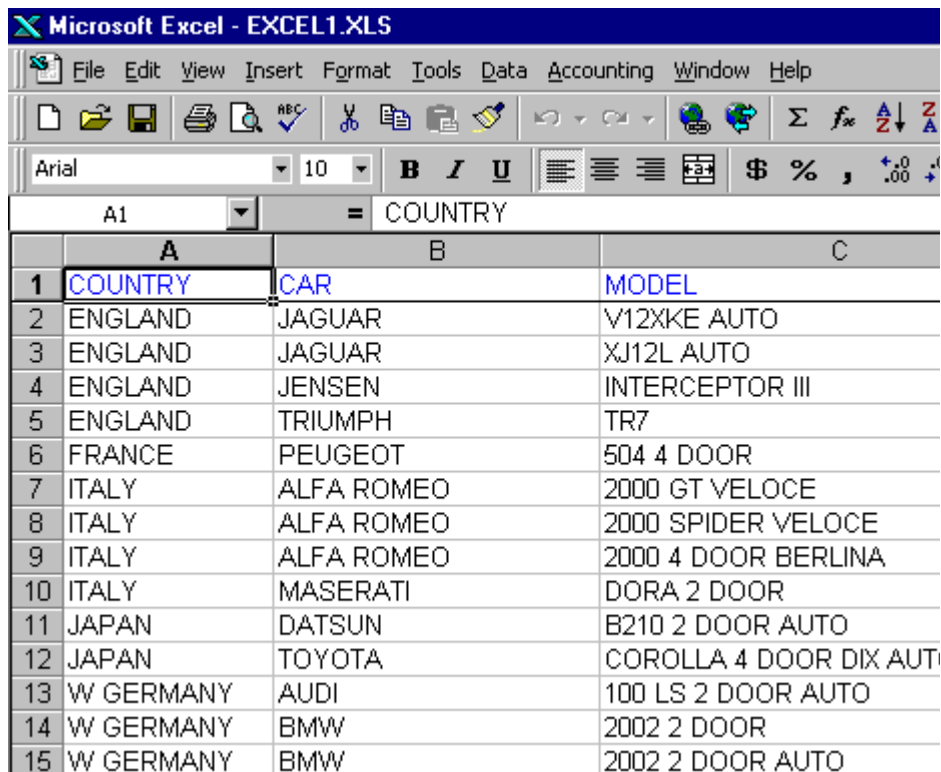
For a detailed description of how to download report output using the Web Interface for FOCUS and PCHOLD, see [NF730: Hold Format PDF](#).

### **Example** Creating an Excel Spreadsheet in a Report Request

Consider the following request run in CMS:

```
TABLE FILE CAR
PRINT CAR MODEL RETAIL_COST DEALER_COST
BY COUNTRY
ON TABLE HOLD AS EXCEL1 FORMAT EXCEL
END
```

This request creates the file EXCEL1 XLS A. After transferring this file (using FTP in binary mode) to a file named *excel1.xls* on your PC, you can open it in Excel:



**Microsoft Excel - EXCEL1.XLS**

File Edit View Insert Format Tools Data Accounting Window Help

Arial 10 B I U

A1 = COUNTRY

|    | A         | B          | C                       |
|----|-----------|------------|-------------------------|
| 1  | COUNTRY   | CAR        | MODEL                   |
| 2  | ENGLAND   | JAGUAR     | V12XKE AUTO             |
| 3  | ENGLAND   | JAGUAR     | XJ12L AUTO              |
| 4  | ENGLAND   | JENSEN     | INTERCEPTOR III         |
| 5  | ENGLAND   | TRIUMPH    | TR7                     |
| 6  | FRANCE    | PEUGEOT    | 504 4 DOOR              |
| 7  | ITALY     | ALFA ROMEO | 2000 GT VELOCE          |
| 8  | ITALY     | ALFA ROMEO | 2000 SPIDER VELOCE      |
| 9  | ITALY     | ALFA ROMEO | 2000 4 DOOR BERLINA     |
| 10 | ITALY     | MASERATI   | DORA 2 DOOR             |
| 11 | JAPAN     | DATSUN     | B210 2 DOOR AUTO        |
| 12 | JAPAN     | TOYOTA     | COROLLA 4 DOOR DIX AUTO |
| 13 | W GERMANY | AUDI       | 100 LS 2 DOOR AUTO      |
| 14 | W GERMANY | BMW        | 2002 2 DOOR             |
| 15 | W GERMANY | BMW        | 2002 2 DOOR AUTO        |

## NF730: Hold Format PDF

FOCUS can now generate output in Adobe® Portable Document Format (PDF). This feature enables Web Interface users to produce reports with all PDF formatting options (for example, headings, footings, and titles) correctly aligned on the physical pages. PDF also supports StyleSheets incorporating drill-downs and links to URLs.

### Required Software Configuration

Adobe Acrobat Reader® Version 3.01 or higher is required to display PDF output, however, no third-party products are needed to *produce* it. The Adobe Acrobat Reader is Internet shareware for Windows 95, Windows NT, UNIX, and Macintosh, and is available free from their Web site, <http://www.adobe.com>.

Reports viewed with Adobe Acrobat Reader look precisely as if printed. By configuring the Acrobat Reader as a plug-in on your Web browser, PDF output displays directly inside the browser window in printed format without additional setup or configuration.

Browser users who have not installed Acrobat Reader can save PDF files to disk or download them to a PC when prompted by the browser and then transfer them later to a machine with the Acrobat Reader to display them. Users can then either run the standalone Acrobat Reader program or use a browser with the PDF plug-in to view the PDF files.

### Syntax    How to Create PDF Output

The syntax is:

```
ON TABLE {HOLD|SAVE} FORMAT PDF [AS filename]
```



where:

ON TABLE

Is required syntax if you create the PDF file within a report request.

*filename*

Assigns a name to the Hold file. The default name is HOLD. If you specify an optional AS filename the name that you supply (1-8 characters) is used in place of HOLD. If you issue a FILEDEF for the filename, the PDF output is created in the file specified in the FILEDEF.

In MVS, unless you allocate this ddname to a permanent file, FOCUS allocates it to a temporary dataset.

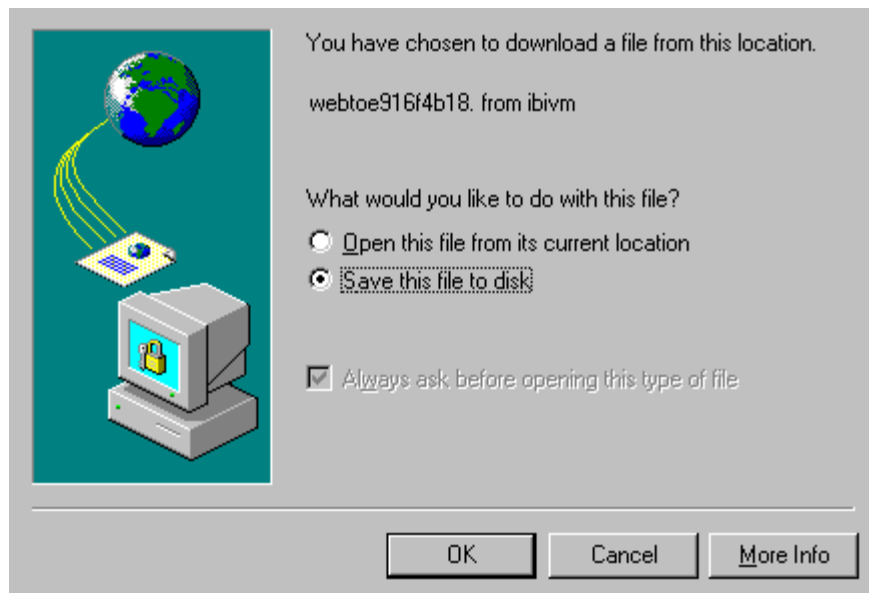
In CMS, this name becomes the filename. The filetype is PDF.

### Downloading PDF Output

The technique for downloading PDF files depends on how you accessed FOCUS. PDF-formatted Hold files created on the mainframe can be downloaded to the PC using FTP transfers. With the Web Interface, browser users can issue the following PCHOLD syntax to download PDF files to their browsers.

ON TABLE PCHOLD FORMAT PDF

The Web Interface automatically FTPs output to your PC if you choose. A browser window opens after the command is issued, inquiring whether you wish to have the file opened immediately or saved to disk.



## **Example** Creating a PDF-formatted Report Using the CAR File

This report request generates the PDF report that follows.

```
TABLE FILE CAR
HEADING CENTER
"CAR COSTS PER COUNTRY"
FOOTING
"----> Uncentered footing"
PRINT
MODEL DEALER_COST RETAIL_COST
BY COUNTRY
BY CAR
WHERE COUNTRY = 'ENGLAND' OR 'ITALY'
ON CAR SUBTOTAL
ON TABLE PCHOLD FORMAT PDF
END
```

Acrobat Reader - [HOLD.PDF]

File Edit View Tools Window Help

PAGE 1

| COUNTRY                 | CAR        | CAR COSTS PER COUNTRY<br>MODEL | DEALER_COST | RETAIL_COST |
|-------------------------|------------|--------------------------------|-------------|-------------|
| ENGLAND                 | JAGUAR     | V12XKE AUTO                    | 7,427       | 8,878       |
|                         |            | XJ12L AUTO                     | 11,194      | 13,491      |
| *TOTAL CAR JAGUAR       |            |                                | 18,621      | 22,369      |
|                         | JENSEN     | INTERCEPTOR III                | 14,940      | 17,850      |
| *TOTAL CAR JENSEN       |            |                                | 14,940      | 17,850      |
|                         | TRIUMPH    | TR7                            | 4,292       | 5,100       |
| *TOTAL CAR TRIUMPH      |            |                                | 4,292       | 5,100       |
| ITALY                   | ALFA ROMEO | 2000 GT VELOCE                 | 5,660       | 6,820       |
|                         |            | 2000 SPIDER VELOCE             | 5,660       | 6,820       |
|                         |            | 2000 4 DOOR BERLINA            | 4,915       | 5,925       |
| *TOTAL CAR ALFA ROMEO   |            |                                | 16,235      | 19,565      |
|                         | MASERATI   | DORA 2 DOOR                    | 25,000      | 31,500      |
| *TOTAL CAR MASERATI     |            |                                | 25,000      | 31,500      |
| TOTAL                   |            |                                | 79,088      | 96,384      |
| ---> UNCENTERED FOOTING |            |                                |             |             |

Page 1 of 1 100% 8.5 x 11 in

## NF654: HOLD From External Sort

External sorts can be used to create HOLD files. This can lead to savings of up to twenty percent on processing time. The gains are most notable with relatively simple requests against large databases.

### **Syntax**    How to Create HOLD FILES with an External Sort

```
SET EXTHOLD = [OFF|ON]
```

where:

OFF

Disables HOLD files by an external sort. OFF is the default.

ON

Enables HOLD files by an external sort.

### **Conditions for Using External Sort to Create a HOLD File**

- The default setting of EXTSORT=ON must be in effect.
- EXTHOLD must be ON.
- Request must contain a BY field.
- Request must contain ON TABLE HOLD or ON TABLE HOLD AS.

- Your query should be simple (AUTOTABLEFable). AUTOTABLEF analyzes a query and determines whether the combination of verbs and formatting options require the internal matrix or not. In cases where it's determined that a matrix is not necessary to satisfy the query we avoid the extra internal costs associated with creating the matrix. The internal matrix is stored in a file or dataset named FOCSORT. Its default is ON so that performance gains may be realized.
- SET ALL must be OFF.
- There cannot be an IF/WHERE TOTAL or BY TOTAL in the request.
- If a request contains a SUM command, EXTAGGR must be set ON and the only column prefixes allowed are SUM and FST.
- If a request contains a PRINT command, the column prefixes allowed are SUM, AVE, MAX, MIN, FST and LST.

## NF597: Aggregation by External Sort

External sorts can be used to perform aggregation with a significant decrease in processing time in comparison to using the sort facility of FOCUS. The gains will be most notable with relatively simple requests against large databases.

### Syntax    How to Use Aggregation in Your External Sort

`SET EXTAGGR = aggropt`

where:

*aggropt*

can be one of the following:

`OFF`

disallows aggregation by an external sort.

`NOFLOAT`

allows aggregation if there are no floating data fields present.

`ON`

allows aggregation by an external sort. ON is the default.

### Conditions for Aggregating with an External Sort

- You must be using SYNC SORT or DFSORT.
- EXTAGGR cannot be set to OFF.
- Your query should be simple. (AUTOTABLE Fable)
- The PRINT display command may not be used in the query.
- SET ALL must be equal to OFF.

- Only the following column prefixes are allowed: SUM, AVG, CNT, FST.
- Columns can be COMPUTED or have a ROW-TOTAL.
- CMS DFSORT does not support aggregation of numeric data types. When SET EXTAGGR = NOFLOAT and your query aggregates numeric data, the external sort is not called and aggregation is performed by the FOCUS sort.

### **Example** How Using an External Sort for Aggregation Can Change Your Output

Using an external sort for aggregation can change the output of your report request.

If you use SUM on an alphanumeric field in your report request without using an external sort, FOCUS displays the last instance of the sorted fields in the output. Turning on aggregation in the external sort results in the first record being displayed instead.

With aggregation in the external sort turned on:

```
SET EXTAGGR = ON
TABLE FILE CAR
SUM CAR BY COUNTRY
END
```

The output is:

| COUNTRY   | CAR        |
|-----------|------------|
| -----     | ----       |
| ENGLAND   | JAGUAR     |
| FRANCE    | PEUGEOT    |
| ITALY     | ALFA ROMEO |
| JAPAN     | DATSUN     |
| W GERMANY | AUDI       |



With aggregation in the external sort turned off:

```
SET EXTAGGR = OFF
TABLE FILE CAR
SUM CAR BY COUNTRY
END
```

The output is:

| COUNTRY   | CAR      |
|-----------|----------|
| -----     | ---      |
| ENGLAND   | TRIUMPH  |
| FRANCE    | PEUGEOT  |
| ITALY     | MASERATI |
| JAPAN     | TOYOTA   |
| W GERMANY | BMW      |

**Note:** The SET SUMPREFIX command in conjunction with aggregation using an external sort also affects the order of information displayed in your report. For complete information on SUMPREFIX please see New Feature Bulletin 728, SUMPREFIX.

## Reference Special Considerations

When aggregation is performed by an external sort the statistical variables &RECORDS and &LINES are of equal value. This is done because the external sort products do not return a line count for the answer set. This is a behavior change and affects any code that checks the value of &LINES.

## NF728: Changing Retrieval Order with Aggregation

When an external sort product performs aggregation of alphanumeric or smart date formats, the order of the answer set returned differs from the order of the FOCUS sorted answer sets.

External sort products return the first alphanumeric or smart date record that was aggregated. Conversely, FOCUS returns the last record.

The SUMPREFIX command deals with this difference in behavior by allowing users to choose which order the answer set should display.

### Syntax    Setting Retrieval Order

```
SET SUMPREFIX = {LST|FST}
```

where:

LST

Displays the last value in cases of data aggregation of alphanumeric or smart date data types.

FST

Displays the first value in cases of data aggregation of alphanumeric or smart date data types.

## NF655: FOCPROF - The System Wide Profile

FOCPROF is a new global profile for FOCUS. While the FOCPARM profile supports only FOCUS SET commands, this new profile can contain any command that is valid in a FOCEXEC, including TABLE, GRAPH, MATCH, MODIFY, MAINTAIN, REBUILD, COMPILE, LOAD, Dialogue Manager commands, CMS commands, TSO commands, and DYNAM commands.

### FOCUS Profiles

With the addition of FOCPROF, there are now three FOCUS profiles: FOCPARM, FOCPROF, and PROFILE.

The files FOCPARM and FOCPROF:

- Are members of the ERRORS PDS on MVS.
- Have filetype ERRORS on CMS.

The file PROFILE:

- Is a member of the FOCEXEC PDS on MVS.
- Has filetype FOCEXEC on CMS.

### Using FOCUS Profiles

The order of execution of FOCUS profiles is:

1. FOCPARM, which can contain FOCUS SET commands only.
2. FOCPROF, the new global profile.
3. PROFILE.

## **Procedure** How to Create a FOCPROF Profile

- For MVS, create a new member of the ERRORS PDS named FOCPROF.
- For CMS, create a file with filename FOCPROF and filetype ERRORS.

Edit the FOCPROF file to contain the commands to be executed each time FOCUS is invoked.

## NF660: Multi-volume Support in MVS FOCUS

The latest release of MVS FOCUS gives sites the option of allocating FOCUS databases, Fusion databases, and FOCUS-created sequential files across multiple volumes.

### Advantages of Multi-volume Data Sources

Many sites prefer to distribute high volume data sources across multiple volumes in order to manage:

- Use of storage on specific devices or device types.
- Run-time access to these devices.
- B37 abends.

You can now use this performance tuning technique (also known as *data striping*) with FOCUS databases, Fusion databases, and FOCUS-created sequential files in the MVS batch, TSO, and MSO environments.

### Allocating Multi-volume Data Sources

The SPACE parameter for allocating a data source can include a primary and a secondary allocation. The primary allocation is the amount of space allocated the first time data is written to the data set. The secondary allocation is the amount of space to be allocated, when necessary, for up to 15 additional extents.

For a single-volume data source, processing terminates with a B37 abend when the system detects either of the following conditions:

- A need for more than 16 extents.

- A need for a new secondary extent (below the 16-extent limit) when enough space is not available on the volume.

FOCUS returns the following message to indicate that one of these conditions has occurred:

**(FOC198) FATAL ERROR IN DATABASE I/O. FOCUS TERMINATING CODE: 00000070**

You can prevent this type of abnormal termination by allocating multiple volumes to the data source. With multiple volumes, an out of space condition on the first volume causes allocation to start on another volume.

With multiple volumes, the allocation process varies slightly for each of the following:

- The first volume.
- Intermediate volumes.
- The last volume.

The following table describes the multi-volume allocation process:

|                    |                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Primary Allocation | <p>The primary allocation is applied to the first volume only. It can consist of the number of extents allowed by MVS for a primary allocation.</p> <p><b>Note:</b> A data source with no secondary space allocation is limited to a single volume.</p> |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Secondary Allocation | <p><b>1.First volume:</b></p> <p>As many extents as are available, up to the 16-extent limit, are allocated and filled before continuing to the second volume.</p> <p><b>2.Intermediate volume:</b></p> <p>Depending on the space available, up to 16 extents are filled before allocation begins on the next volume.</p> <p><b>3.Last volume:</b></p> <p>Once the need for a number of extents greater than the limit is detected:</p> <ul style="list-style-type: none"><li>• For a FOCUS or Fusion database, processing terminates with the following message<br/><code>(FOC198) FATAL ERROR IN DATABASE I/O. FOCUS<br/>TERMINATING CODE 00000070</code></li><li>• For temporary FOCSORT files, after all volumes and extents are filled allocation spills to up to 15 additional temporary files, each with 16 extents. (This feature, NF536, <i>Multi-Image FOCSORT</i>, was added in FOCUS 7.0.6.) The SPACE allocation for each spill file is the same as the SPACE allocation for the original FOCSORT file.</li></ul> |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

For example:

```
//FOCSORT DD SPACE=(TRK,(5,5))
```

This allocates a total of  $5 + (5 \times 15) = 80$  tracks. When the 81st track is needed, another temporary data set is allocated with the parameter `SPACE=(TRK,(5,5))`. If necessary, this additional step is repeated a total of 15 times yielding a total of  $80 \times 16$  tracks for FOCSORT.

If enough space is not available after filling all of the extents of all of the spill files, the FOC198 message is issued and processing terminates.

**Note:** The number of extents actually obtained on any volume may be less than 16; however, in most situations 16 will be available and used.

### Syntax    How to Allocate a Multi-volume Data Source in the MVS Batch Environment

You have two choices for statically allocating a new multi-volume FOCUS database, Fusion database, or sequential file.

You can list multiple VOLSER identifiers on the DD card for the multi-volume data source:

```
//ddname DD DSN=dsname,VOL=SER=(vol1,...,voln),...
```

Alternatively, you can ask for multiple units of a specific type:

```
//ddname DD DSN=dsname,UNIT=(type,n),...
```



where:

*ddname*

Is the DDNAME associated with the multi-volume data source.

*dsname*

Is the data set name of the multi-volume data source.

*vol1,...,voln*

Are the volume identifiers for the each of the volumes to use.

*type*

Is the type of unit to use.

*n*

Is the number of units.

### **Allocating a Multi-volume Data Source in the TSO and MSO Environments**

In both TSO and MSO you have two choices for dynamically allocating a multi-volume data source:

- You can list multiple volume identifiers.
- You can specify the number of units to use and let the system choose the specific volumes. All of the units will be the same type (for example, 3390).

## **Syntax**    How to Allocate Specific Volumes in the TSO and MSO Environments

To allocate specific volumes for a multi-volume data source, use the following syntax:

- In TSO

```
TSO ALLOC ... VOLUME('vol1,...,voln')...
```

- In MVS FOCUS or MSO

```
DYNAM ALLOC ... VOL vol1,...,voln ...
```

where:

```
vol1,...,voln
```

Are the volume identifiers for the each of the volumes to use.

## **Syntax**    How to Specify the Number of Units in the TSO and MSO Environments

To specify the number of volumes for a multi-volume data source and let the system choose the specific volumes, use the following syntax:

- In TSO

```
TSO ALLOC ... UCOUNT('n') UNIT('type') ...
```

- In MVS FOCUS or MSO

```
DYNAM ALLOC ... UCOUNT n UNIT type ...
```

where:

```
n
```

Is the number of volumes to use.

*type*

Is the type of unit to use.

### Note:

- UNIT VIO is not supported.
- The RLSE option of the SPACE parameter is not supported.
- The DYNAM UCOUNT parameter is also discussed in NF670, *DYNAM Support for Unit Count*.

## Example Allocating a Data Source to Two Volumes

The following DYNAM command allocates two volumes to a data source called MULTVOL:

```
DYNAM ALLOC FI MULTVOL DS USER1.FOCTST.MULTVOL TRACK SPACE 4 4 REU -
UCOUNT 2 UNIT SYSDA CATALOG
```

With this allocation, a second volume will be used when the 17th extent is needed.

## Syntax How to Display the Volume Identifiers Allocated to a Multi-volume Data Source

To see the data set information associated with a specific DDNAME, issue the following command

```
? TSO DDNAME ddname
```

where:

*ddname*

Is the DDNAME allocated to the data set whose volume identifiers you want to see.

## Example Displaying Multi-volume Data Set Information

The following example shows how to display data set information for DDNAME MULTVOL:

```
? tso ddname multvol
```

The following information is returned. Notice that two volume serial identifiers are listed on the VOLSER line:

```
DDNAME = MULTVOL
DSNAME = USER1.FOCTST.MULTVOL
DISP = NEW
DEVICE = DISK
VOLSER = MFOC02,MFOC01
DSORG = PS
RECFM = F
SECONDARY = 4
ALLOCATION = TRACKS
BLKSIZE = 4096
LRECL = 4096
TRKTOT = 92
EXTENTSUSED = 23
BLKSPERTRK = 12
TRKSPERCYL = 15
CYLSPERDISK = 2227
BLKSWRITTEN = 1104
FOCUSPAGES = 1059
> >
```

## **Choosing Default Sizes for FOCUS-created Files**

IBITABLA, the file that contains default allocations for FOCUS-created files, has been enhanced to allow a unit count for FOCUS databases, Fusion databases, and all sequential FOCUS-created files. The advantages of multi-volume allocations are described in [\*Advantages of Multi-volume Data Sources\*](#).

Every FOCUS release is shipped with a member of the FOCCTL.DATA PDS named IBITABLA. This member contains default allocations for all FOCUS-created files that you do not specifically allocate in your FOCUS session, JCL, or CLIST. As part of the installation process, the FOCUS installer should copy the new version of IBITABLA to the ERRORS PDS and edit it to conform to the standards for the site.

When a new release of FOCUS is shipped, the installer should compare the latest version of IBITABLA to the prior site-specific version in order to construct a new site-specific version of IBITABLA. In this way, the installer will be aware of changes in format (such as new fields or ddnames added in the new release) that must be addressed in the customized copy.

The following is the default IBITABLA shipped with FOCUS Version 7.0 Release 9:

```
*...+...1...+...2...+...3...+...4...+
HOLD CYLS 5 10 3,
HOLDMAST TRKS 5 5 36 ,
SAVE CYLS 5 10 3,
REBUILD CYLS 5 10 3,
FOCSML CYLS 5 5 2,
FOCUS CYLS 5 5 1,
FOCSTACK TRKS 5 5 2,
FOCSORT CYLS 5 5 1,
OFFLINE CYLS A ,
SESSION TRKS 5 5 2,
FOCCOMP TRKS 5 5 12 ,
HOLDACC TRKS 5 5 12 ,
FMU TRKS 5 5 12 ,
TRF TRKS 5 5 12 ,
FOCPOOLT CYLS 5 20 NOHIPER 4,
FUSION CYLS 5 50 NOHIPER 4,
MDI CYLS 5 20 NOHIPER 4,
FOC$HOLD CYLS 5 5 2,
EXTINDEX CYLS 5 5 2,
```

The unit count field is columns 44-45. The fields are:

| Columns | Length | Comments                      |
|---------|--------|-------------------------------|
| 01-08   | 8      | Class of file - DDname        |
| 10-13   | 4      | Allocation units (CYLS, TRKS) |
| 15-17   | 3      | Primary allocation            |

| <b>Columns</b> | <b>Length</b> | <b>Comments</b>                                                              |
|----------------|---------------|------------------------------------------------------------------------------|
| 19-21          | 3             | Secondary allocation                                                         |
| 23-24          | 2             | Number of directory blocks (blank specifies a sequential file; 0 is invalid) |
| 26-26          | 1             | SYSOUT class                                                                 |
| 28-33          | 6             | Volume serial on which to allocate                                           |
| 35-42          | 8             | Type of unit to allocate (for example, 3390, DASD, NOHIPER*)                 |
| 44-45          | 2             | Unit count                                                                   |

Note that partitioned data sets do not support multi-volume allocations.

If you enter a non-valid value for any field in IBITABLA, FOCUS substitutes the corresponding value from the original version of IBITABLA that was shipped with FOCUS.

## Example Allocating DDNAME FOCSTACK to Two Volumes in IBITABLA

Assume you replaced the original FOCSTACK line with the following in IBITABLA:

```
|...+...1...+...2...+...3...+...4...+
FOCSTACK TRKS 5 5 3390 2,
```

This line indicates the following allocation attributes:

- DDname = FOCSTACK
- Allocation is in tracks:  
    Primary tracks=5  
    Secondary tracks=5
- Type of unit = 3390
- Number of units=2

The resulting dynamic allocation is equivalent to the following JCL:

```
//FOCSTACK DD SPACE=(TRK,(5,5)),UNIT=(3390,2),...
```

## Reference Usage Notes for IBITABLA

- IBITABLA is a fixed-format file.
- Each data field must be placed in specific columns, but leading or trailing blanks are allowed. (There is at least one blank between successive data fields.)
- All lines beginning with an asterisk (\*) are comments.
- Unit count is ignored for HiperFOCUS files with DISP=(NEW,DELETE).



## NF584: Dynamically Setting the IDMS DBNAME and DICTNAME

The new IDMS Interface commands SET DBNAME and SET DICTNAME enable you to dynamically change the DBNAME and DICTNAME parameters at any time during your FOCUS session.

If you do not issue these commands, the Interface reads the DBNAME and DICTNAME from the Access File. However, once you issue them, the new DBNAME and DICTNAME values take precedence over those in your Access Files. The new values remain in effect until you either:

- Reissue the SET commands with new DBNAME and DICTNAME values.
- End your FOCUS session.
- Reinstate the Access File parameters by issuing the SET commands with the DEFAULT option.

### Syntax    How to Set the DBNAME and DICTNAME

Issue the following commands at the FOCUS session prompt, in a FOCEXEC, or in any supported profile:

```
TSO IDMSR SET DBNAME {dbname|DEFAULT}
TSO IDMSR SET DICTNAME {dictname|DEFAULT}
```

where:

*dbname*

Is the IDMS database name that you want to access.

*dictname*

Is the IDMS dictionary name that you want to access.

### DEFAULT

Causes the Interface to read the value from the Access File.

## Syntax How to Display the Current Settings

To display the settings that are currently in effect, issue the following command:

```
TSO IDMSR SET ?
```

## Example Dynamically Changing the DBNAME and DICTNAME Values

```
TSO IDMSR SET DBNAME EMPDEMO
```

```
TSO IDMSR SET DICTNAME APPLDICT
```

## NF673: Model 204 Interface Account Split

The Model 204 Interface has been enhanced to accept an account code as part of the logon string.

The syntax for specifying the logon account in the Access File is

```
ACCOUNT=x[y], ACCOUNTPASS=pswd, IFAMCHNL=ifchnl,$
```

The SET command syntax for specifying the logon account is

```
{TSO|MVS} M204IN SET ACCTNAME x[y]
{TSO|MVS} M204IN SET ACCTPASS pswd
```

where:

*TSO|MVS*

Is a required environmental prefix. TSO and MVS are synonyms and can be used interchangeably.

*x*

Is the user ID, up to 16 characters.

*y*

Is the account code, up to 15 characters, preceded by exactly one blank.

*pswd*

Is the account password.

### Example Setting the Model 204 Userid and Account Code

Assume the Model 204 userid is SUPERKLUGE and the account code is MIS.

You can issue the following Interface command to set these values:

```
TSO M204IN SET ACCTNAME SUPERKLUGE MIS
```

You can also set them in the Access File with the following attribute:

```
ACCOUNT=SUPERKLUGE MIS, ...
```

## NF720: SQLJOIN OUTER Setting for Relational Interfaces

With the new SQLJOIN OUTER setting you can control when the relational Interfaces optimize outer joins without affecting the optimization of other operations. This parameter provides backward compatibility with prior releases of the relational Interfaces and enables you to fine-tune your applications.

When join optimization is in effect, the Interface generates one SQL SELECT statement that includes every table involved in the join. The RDBMS can then process the join. When join optimization is disabled, the Interface generates a separate SQL SELECT statement for each table, and FOCUS processes the join.

In FOCUS Version 7.0 Release 6, the relational Interfaces were enhanced to optimize outer joins. The following command causes the Interface to generate an outer join:

```
SET ALL = ON
```

Beginning with FOCUS Version 7.0 Release 6, issuing this command with OPTIMIZATION enabled invokes outer join optimization. In FOCUS releases prior to 7.0.6, this setting disabled optimization so that FOCUS always processed the outer join. Turning OPTIMIZATION OFF still causes FOCUS to process the join, but it disables *all* optimization enhancements, not just outer join processing.

Starting with FOCUS Version 7.0 Release 9, you can use the SQLJOIN OUTER setting to disable outer join optimization while leaving other optimization enhancements in effect.

### Syntax    How to Control Outer Join Optimization

Issue the following command at the FOCUS prompt, in a stored procedure, or in any supported profile:

```
SQL target_db SET SQLJOIN OUTER {ON|OFF}
```

where:

*target\_db*

Indicates the target RDBMS. Valid values are DB2, SQLDS, SQLDBC, SQLORA, or SQLIDMS. Omit if you issued the SET SQLENGINE command.

ON

Enables outer join optimization.

OFF

Disables outer join optimization. OFF is the default value.

#### Note:

- The SQLJOIN OUTER setting is available only when optimization is enabled (that is, OPTIMIZATION is not set to OFF).
- The SQLJOIN OUTER setting is ignored when SET ALL = OFF.

## **Effects of Combinations of Settings on Outer Join Optimization**

The following table describes how different combinations of OPTIMIZATION and SQLJOIN OUTER settings affect Interface behavior. It assumes that SET ALL = ON:

| <b>Settings</b>     |                      | <b>Results</b>                                         |                                    |
|---------------------|----------------------|--------------------------------------------------------|------------------------------------|
| <b>OPTIMIZATION</b> | <b>SQLJOIN OUTER</b> | <b>Outer Join Optimized?</b>                           | <b>Other Optimization Features</b> |
| ON                  | ON                   | Yes                                                    | Enabled                            |
| ON                  | OFF                  | No                                                     | Enabled                            |
| OFF                 | N/A                  | No                                                     | Disabled                           |
| SQL                 | ON                   | Yes, in all possible cases                             | Enabled                            |
| SQL                 | OFF                  | No                                                     | Enabled                            |
| FOCUS               | ON                   | Yes if results are equivalent to FOCUS managed request | Enabled                            |
| FOCUS               | OFF                  | No                                                     | Enabled                            |

## **Reference SQLJOIN OUTER Messages**

If SQLJOIN OUTER is set to OFF, the following message displays when you issue the SQL ? query command:

```
(FOC1420) OPTIMIZATION OF ALL=ON AS LEFT JOIN - : OFF
```

## NF652: Teradata Interface Kanji Support

The Teradata Interface now supports the DBCS (Double Byte Character Set) Kanji characters described by the Teradata datatypes GRAPHIC and VARGRAPHIC.

The following conversion chart shows the SQL datatypes that support the Kanji character set and their corresponding ACTUAL formats in the Master File:

| SQL Datatype | ACTUAL Format | Description                                                                                                                                                                                                                                     |
|--------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GRAPHIC      | Kn            | DBCS Kanji character set. Fixed-length string of 'n' 16-bit characters where $0 < n \leq 127$ . The appropriate corresponding USAGE format is A(2n+2).                                                                                          |
| VARGRAPHIC   | Kn            | DBCS Kanji character set. Varying-length string of 'n' 16-bit characters where $0 < n \leq 127$ . The appropriate corresponding USAGE format is A(2n+2).<br><b>Note:</b> LONG VARGRAPHIC (or VARGRAPHIC (n) where $n > 127$ ) is not supported. |



## NF722: FOCUS Client DNS Names Support

This feature enables the FOCUS Client EDACFG file to identify an EDA server by host name rather than IP address. The EDACFG file is the client communications configuration file allocated to DDNAME EDACFG. In prior versions of FOCUS Client, the EDACFG file had to supply the IP address of the EDA server to which it would connect.

The domain name system (DNS) is a global network of servers that translate host names, such as [www.ibi.com](http://www.ibi.com), into IP addresses. For more information about FOCUS Client, see NF494, *FOCUS Client - Remote Data Access via EDA/SQL*, which was implemented in FOCUS 7.0.5.

### Syntax    How to Invoke DNS Names Support

The syntax for specifying a host name in the client configuration file for TCP/IP is

```
HOST = hostname
```

where:

```
hostname
```

Is the host name of the EDA server.

## **Example Using DNS Names Support**

The following client configuration file is used for connecting to the host named IBIMVS:

```
NAME = EDA/SQL CLIENT USING CS/3 TCP/IP
NODE = TCPOUT
 BEGIN
; TRACE = 31
 PROTOCOL = TCP
 CLASS = CLIENT
 HOST = IBIMVS ; DNS NAME OF HOST
 SERVICE = 2459 ; PORT NUMBER OF THE EDA SERVER
 END
```

## NF656: Controlling REBUILD Messages

This feature allows for direct control over the frequency with which REBUILD issues messages. FOCUS, by default, displays a message for every 1000 records read during the database retrieval and load phases of the REBUILD utility. The message, REFERENCE..AT SEGMENT 1000, REFERENCE..AT SEGMENT 2000.. is a function of the number of records in the FOCUS file being rebuilt. The frequency of these messages can become problematic for larger FOCUS files because CMS spool space may be limited.

### Syntax    How to Control REBUILD Messages

The user can set how often the message is displayed by issuing the command:

```
SET REBUILDMSG = n
```

where:

*n*

is any 8-byte integer.

A setting of less than 1000 generates a diagnostic and keeps the current setting. The current setting will either be the default of 1000, or the last valid integer greater than 999 to which REBUILDMSG was set. A setting of 0 disables the 'REFERENCE..AT SEGMENT' messages.

## Example Controlling Display of REBUILD Messages

The following example shows a REBUILD CHECK function where REBUILDMSG has been set to 4000, and the database contains 19,753 records.

```
ENTER NAME OF FOCUS/FUSION FILE (FN FT FM)
...
STARTING..
REFERENCE..AT SEGMENT 4000
REFERENCE..AT SEGMENT 8000
REFERENCE..AT SEGMENT 12000
REFERENCE..AT SEGMENT 16000
NUMBER OF SEGMENTS RETRIEVED= 19753
CHECK COMPLETED...
```

## NF670: DYNAM Support for Unit Count

The DYNAM command now supports the unit count parameter for allocating multi-volume data sources. With the UCOUNT parameter you can allocate a file to multiple volumes of a particular type of storage device without indicating specific volume serial numbers.

### Advantages of Multi-volume Data Sources

Many sites prefer to distribute high volume data sources across multiple volumes in order to manage:

- Use of storage on specific devices or device types.
- Run-time access to these devices.

This new DYNAM parameter is particularly useful for allocating large temporary files such as FOCSORT, FOCPOOLT, and HOLD files in the TSO and MSO environments.

### Syntax How to Specify the DYNAM Unit Count Parameter

```
DYNAM ALLOC ... UCOUNT n UNIT type ...
```

where:

*n*

Is the number of volumes to use.

*type*

Is the type of unit to use. **Note:** UNIT VIO is not supported.

## **Example** Allocating a HOLD File to Two Volumes

The following DYNAM command allocates two 3390s to a HOLD file:

```
DYNAM ALLOC FILE HOLD SPACE 20,10 TRACKS UCOUNT 2 UNIT 3390
```

## NF684: PCHOLD for Non-Html Files

Web Interface support of PCHOLD enables Web browser users to extract five types of preformatted data from the mainframe and either display the output immediately on their browsers or automatically transfer the files via FTP to their PCs.

### Using PCHOLD for Formats LOTUS, DIF, EXCEL, or PDF

When you issue the PCHOLD command for files with LOTUS, DIF, EXCEL, or PDF formats, the Web Interface returns a notification window telling you that the file is being downloaded. You can then rename the file on the PC using the correct extension from the table below. Word processing files (Format=WP) are always displayed first on the browser and can then be saved to the PC.

### Syntax Specifying PCHOLD in a TABLE Request

`ON TABLE PCHOLD FORMAT fmt`

where:

### *fmt*

Specifies the format of the PCHOLD extract file. When downloading these files to the PC you must use the appropriate extensions from the following table:

| File Format | Content                                    | Extension    |
|-------------|--------------------------------------------|--------------|
| LOTUS       | Lotus PRN files                            | .prn         |
| DIF         | Spreadsheets without headings              | .dif         |
| EXCEL       | Excel spreadsheets with headings           | .xls         |
| PDF         | ADOBE Portable Document Format (PDF) files | .pdf         |
| WP          | Word processing files                      | .txt or .doc |

### **Syntax**    Specifying PCHOLD for a WP File in a TABLE Request

`ON TABLE PCHOLD FORMAT WP`

WP-formatted files are displayed immediately on the browser and can be saved to the PC. When the file appears, select the Save As option, providing a file name with an appropriate file extension for your word processor (for example, extension for MS Word = .doc).

`SAVE AS myfile.doc`



## **Example** Using PCHOLD for Non-Html Files

The request below creates a spreadsheet without headings (format=DIF) displayed on the screen that follows:

```
table file car
print compute sales1/i9 = sales;
profit/d10.2 = retail_cost - dealer_cost;
adate/yymd = '1999/04/29';
by model
ON TABLE PCHOLD FORMAT DIF
end
```

Microsoft Excel - testdif

File Edit View Insert Format Tools Data Window Help

Arial 10 B I U

|    | A                       | B     | C    | D        | E | F | G |
|----|-------------------------|-------|------|----------|---|---|---|
| 1  | B210 2 DOOR AUTO        | 43000 | 513  | 19990429 |   |   |   |
| 2  | COROLLA 4 DOOR DIX AUTO | 35030 | 453  | 19990429 |   |   |   |
| 3  | DORA 2 DOOR             | 0     | 6500 | 19990429 |   |   |   |
| 4  | INTERCEPTOR III         | 0     | 2910 | 19990429 |   |   |   |
| 5  | TR7                     | 0     | 808  | 19990429 |   |   |   |
| 6  | V12XKE AUTO             | 0     | 1451 | 19990429 |   |   |   |
| 7  | XJ12L AUTO              | 12000 | 2297 | 19990429 |   |   |   |
| 8  | 100 LS 2 DOOR AUTO      | 7800  | 907  | 19990429 |   |   |   |
| 9  | 2000 GT VELOCE          | 12400 | 1160 | 19990429 |   |   |   |
| 10 | 2000 SPIDER VELOCE      | 13000 | 1160 | 19990429 |   |   |   |
| 11 | 2000 4 DOOR BERLINA     | 4800  | 1010 | 19990429 |   |   |   |
| 12 | 2002 2 DOOR             | 8950  | 140  | 19990429 |   |   |   |
| 13 | 2002 2 DOOR AUTO        | 8900  | 355  | 19990429 |   |   |   |
| 14 | 3.0 SI 4 DOOR           | 14000 | 3752 | 19990429 |   |   |   |
| 15 | 3.0 SI 4 DOOR AUTO      | 18940 | 3123 | 19990429 |   |   |   |
| 16 | 504 4 DOOR              | 0     | 979  | 19990429 |   |   |   |
| 17 | 530I 4 DOOR             | 14000 | 797  | 19990429 |   |   |   |
| 18 | 530I 4 DOOR AUTO        | 15600 | 1095 | 19990429 |   |   |   |

## Reference Notes for Internet Explorer Users

- **LOTUS or DIF.** When using Internet Explorer to view consecutive LOTUS or DIF reports online you must take special precautions to insure getting latest version of temporary files.

This step must be taken to avoid a potential problem caused by the use of the same filename when running consecutive reports for immediate viewing (as opposed to saving the output in uniquely named files). Spreadsheet users planning to view multiple consecutive reports online must configure the Internet Explorer browser in the following manner:

- **Internet Explorer Release 5** - Under Tools/Internet Options/Temporary Internet Files, select Check for newer versions automatically.
- **Internet Explorer Release 4** - Under View options/General/Temporary Internet Files, select Check every time.

This step is not required with Netscape Navigator, which checks temporary Internet files for newer versions every time as the default. Users of other browsers must check their browser's handling of this situation and act accordingly.

- **Excel.** When using Internet Explorer to view Excel output you must use the binary MIME type for the file transfer (all other file types are transferred as text).

## NF683: Web Interface Support for Maintain Winforms

This feature enables mainframe FOCUS sites to deploy applications created with the Cactus Workbench to intranet or Internet audiences without installing an EDA or Cactus server on the host machine.

Existing applications can be “webified” by using the Cactus Workbench to convert Maintain Winforms into Webforms. The Focexecs (.fex files) and Winforms (.wfm files) must then be transmitted **manually** to the mainframe using FTP (alphanumeric mode):

- For MVS, transfer the FOCEXEC files to a data set allocated to ddname FOCEXEC and the Winform files to a data set allocated to ddname WINFORMS in your FOCUS CLIST.
- For CMS, transfer the files to your A disk. The FOCEXEC files have filetype FOCEXEC and the Winform files have filetype WINFORMS.

Once these are installed, end users running the Web Interface from a Web browser can execute these applications and access data defined to mainframe FOCUS.

### Prerequisites

Web390 Server Release 3.2 is required to use this feature and end-users will need to install at least Release 4 of Netscape Navigator, Microsoft Internet Explorer, or an equivalently featured browser.

### Procedure How to Execute Maintain Applications From a Browser

There are two ways to execute Maintain applications from the browser window:

1. Use Logon scripts (*Web390 Developer's Guide and Installation Manual* DN1001035.0599 provides instructions for creating Logon scripts).  
Logon scripts can bring browser users directly into the Webform equivalent of a Maintain Winform after they enter the appropriate userid and password. Thereafter, they can work interactively with the applications on their browsers.
2. Users can execute applications directly from the Web Interface Interactive screen

*EX FOCEXECname*

where:

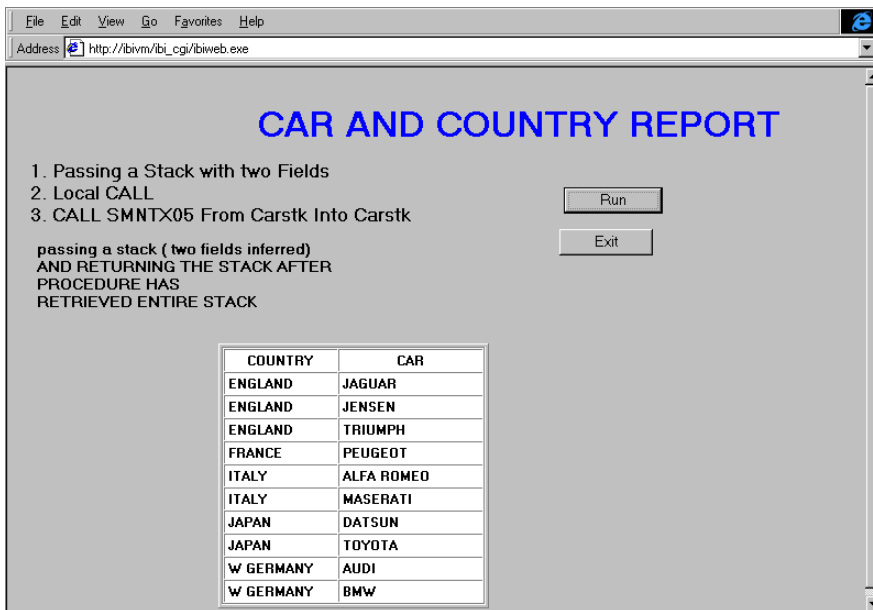
*FOCEXECname*

Is the name of the target Maintain application.

### **Example Running a Maintain Application From a Browser**

This webified Maintain application issues a simple car-by-country report request, formatting the output on the Webform below:

EX CMNTX05W



## NF691: Escape Character for LIKE Predicate

New syntax exists for the LIKE predicate that enables you to search for special characters in data. You can set an escape character to use in the LIKE predicate. Then, when you include this escape character in front of a special character in the mask pattern, the parser treats the special character as a normal character and searches for it in the data. This next character can be '%' or '\_' which are normally special characters. LIKE may be coded in WHERE, DEFINE, and COMPUTE statements. The mask is an alphanumeric, user-supplied pattern that FOCUS uses to compare characters in a data field value. A mask has two special characters:

1. The percent sign (%) to indicate any number of characters; and
2. The underscore (\_) to indicate a single character in a specified position.

The escape character enhancement permits FOCUS to treat these masking characters as literals within the search pattern and not as wildcards.

Any single character can be used as an escape character, but the one used must be prefaced with the word ESCAPE. The syntax is:

```
WHERE field LIKE 'phrase' ESCAPE 'c'
```

where

```
'c'
```

Is any character embedded in the phrase before a '%' or '\_'.

### Escape Character Capabilities

The escape character is supported by the SQL Interfaces, as well as FOCUS databases. The escape character is only in effect when the ESCAPE syntax is included in the LIKE predicate.

### Syntax    How to Use the Escape Character

The pattern (alphanumeric constant) that follows the LIKE predicate may contain wildcard characters ('%') and ('\_') that users may need to escape in order to use as part of the search pattern. Every LIKE predicate can provide its own escape character to be used within the pattern (or mask). The syntax is as follows:

```
WHERE expression LIKE 'abc\%' ESCAPE '\'
```

where

*expression*

Is the name of the expression to be evaluated in the selection test.

'abc\%'

Is the alphanumeric test value.

'\'

Is the escape character enclosed in single quotation marks. When the escape character is used in the pattern immediately preceding the special character '%' or '\_', FOCUS is instructed to treat the special character as a literal and not as a wildcard. The character itself can also be escaped, thus becoming a normal character in a string (for example, 'abc\%\%').

### Example Using the Escape Character

Using the Car file, assume that both Peugeot and Alfa Romeo produce 4\_door car models. To generate a report showing countries that produce 4\_door car models, the syntax would be as follows:



```
TABLE FILE CAR
PRINT CAR MODEL
BY COUNTRY
WHERE MODEL LIKE '%g_DOOR%' ESCAPE 'g'
END
```

The request produces the following report:

```
PAGE 1

COUNTRY CAR MODEL

FRANCE PEUGEOT 504 4_DOOR
ITALY ALFA ROMEO 2000 4_DOOR BERLINA
```

### Reference Special Considerations

- The use of an escape character in front of any character other than '%', '\_', and itself will be ignored.
- Only one escape character can be used per LIKE phrase.
- If a WHERE clause is used with lazy ORs, the ESCAPE must be on the first phrase and will apply to all subsequent phrases in that WHERE clause. For example:

```
WHERE field LIKE 'ABCg_' ESCAPE 'g' OR 'ABCg%' OR 'g%ABC'
```

### Reference Error Messages

(FOC36251) SYNTAX ERROR IN LIKE OPERATOR

Alphanumeric mask must follow the LIKE operator. An optional keyword ESCAPE followed by a single character alphanumeric constant in apostrophes can be used after the mask.

## NF718: DYNAM Support for Existing Relative GDG Numbers

The DYNAM command now supports allocation of existing iterations of a Generation Data Group (GDG) using relative index numbers. Existing iterations are those with index numbers less than or equal to zero.

**Note:** DYNAM does *not* support allocation of a new GDG iteration; that is, you cannot use the relative number +1 in a DYNAM allocation for a GDG.

### Using DYNAM With Relative GDG Numbers

The original definition of a GDG assigns it a group name and specifies how many generations will be maintained. Once the maximum number of generations has been reached, each new iteration replaces the oldest existing iteration. The data set name for each iteration is the group name appended with a qualifier that contains the iteration number.

For example, the following GDG, named USER1.HOLD.GDG, has three generations:

| Data Set Name           | Iteration Number | Index Number |
|-------------------------|------------------|--------------|
| USER1.HOLD.GDG.G0003V00 | 3 (Oldest)       | -2           |
| USER1.HOLD.GDG.G0004V00 | 4                | -1           |
| USER1.HOLD.GDG.G0005V00 | 5 (Current)      | 0            |

The current (that is, newest) iteration always has the highest iteration number and corresponds to index number zero. The next newest corresponds to index number -1, and so on.

Prior to this new feature, DYNAM could allocate only the current iteration of a GDG. Now DYNAM supports relative index numbers for allocating any existing iteration.

### **Syntax**    How to Use DYNAM With Relative Index Numbers

Use the following syntax to allocate an existing iteration of a GDG

```
DYNAM ALLOC FILE ddname DS 'group_name(index)' SHR REUSE
```

where:

*ddname*

Is the name of the Master File for the GDG.

*group\_name*

Is the group name of the GDG.

*index*

Is the index number for an existing iteration of the GDG. It must be less than or equal to zero.

## Example Allocating Existing GDG Iterations Using DYNAM With Relative Index Numbers

The GDG named USER1.HOLD.GDG discussed in [Using DYNAM With Relative GDG Numbers](#), is described by Master File GDG1:

```
FILENAME=GDG1 , SUFFIX=FIX
SEGNAME=ORIGIN , SEGTYPE=S1
 FIELDNAME=FLD1 , ,A10,$
 FIELDNAME=FLD2 , ,A20,$
 FIELDNAME=FLD3 , ,A30,$
 FIELDNAME=FLD4 , ,A10,$
```

In each iteration, the value stored in FLD1 is the generation number. For example, USER1.HOLD.GDG.G0004V00 contains the following records:

```
44444444444444444444AAA
44444444444444444444AAA
44444444444444444444AAA
44444444444444444444AAA
44444444444444444444AAA
44444444444444444444AAA
44444444444444444444AAA
```

The following request allocates and prints FLD1 of iteration four (index number -1)

```
> dynam alloc file gdg1 ds 'user1.hold.gdg(-1)' shr reu
> > table file gdg1
> print fld1
> end
```

```
PAGE 1
```

```
FLD1
```

```

```

```
4444444444
```

```
4444444444
```

```
4444444444
```

```
4444444444
```

```
4444444444
```

The following DYNAM command allocates the current iteration of the GDG, and the TABLE request accesses this latest iteration:

```
> dynam free file gdgl
> > dynam alloc file gdgl ds 'user1.hold.gdg(0)' shr reu
> > table file gdgl
> print fld1
> where recordlimit eq 1
> end
PAGE 1
```

```
FLD1
```

```

```

```
5555555555
```

### Syntax Determining Which GDG Iteration is Allocated

To determine which GDG iteration is allocated, issue the ? TSO DDNAME query command:

```
> > ? tso ddname gdgl
```

```
DDNAME = GDG1
DSNAME = USER1.HOLD.GDG.G0003V00
DISP = SHR
DEVICE = DISK
VOLSER = USERME
DSORG = PS
RECFM = FB
SECONDARY = 5
ALLOCATION = TRACKS
BLKSIZE = 8000
LRECL = 80
TRKTOT = 1
EXTENTSUSED = 1
BLKSPERTRK = 6
TRKSPERCYL = 15
CYLSPERDISK = 3340
BLKSWRITTEN = 1
> >
```

The DSNAME, USER1.HOLD.GDG.G0003V00, indicates that the third iteration is allocated.

### Reference Error Messages

The MESSAGE parameter must be set ON in order to receive these messages.

An attempt to allocate a new iteration of a GDG (index number +1) generates the following error message:

```
(FOC880) DYNAMIC ALLOCATION ERROR: IKJ56871I DATA SET name
 NOT ALLOCATED, RELATIVE GENERATION NUMBER INCOMPATIBLE FOR
 SPECIFIED STATUS, #099:0C-0394
```

Allocating an index number that is out of range (too large a negative number), generates the following message:

```
(FOC855) UNABLE TO LOCATE DATASET name, #099:04-1708
```

## NF735: Enhancement to ? SET

Two options have been added to the ? SET command. They are ? SET FOR and ? SET NOT. The FOR option lists the current state of the command queried, and details where it may be set within FOCUS. The NOT option produces a list of SET commands not settable in five specific areas.

### Syntax Querying a Command

```
? SET FOR parameter
```

where:

```
parameter
```

Is any SET parameter.

### Example Querying the Current State of EXTSORT

Entering

```
? SET FOR EXTSORT
```

yields

```
EXTSORT ON
```

```

SETTABLE FROM COMMAND LINE : YES
SETTABLE ON TABLE : YES
SETTABLE FROM SYSTEM-WIDE PROFILE : YES
SETTABLE FROM HLI PROFILE : YES
POOL TABLE BOUNDARY : YES
```

```
>
```



The preceding screen shows that EXTSORT is currently set ON and that it is settable from all five features.

### **Syntax**    **Determining Which Commands Are Not Settable In Each of the Five Features**

```
? SET NOT functional_area
```

where:

*functional\_area*

can be one of the following five areas:

- PROMPT (in a PROMPT command)
- ONTABLE (in a report request)
- FOCPARM (in the FOCPARM profile)
- HLIPROF (in the HLI profile)
- PT (Pooled Tables)

### **Example**    **Determining Which Commands Are Not Settable In a Report Request**

Entering

```
? SET NOT ONTABLE
```

yields:

NON-SETTABLE ON TABLE PARAMETER SETTINGS

|               |     |             |           |            |          |
|---------------|-----|-------------|-----------|------------|----------|
| BINS          | 64  | LANGUAGE    | AMENGLISH | REBUILDMSG | 1000     |
| BLKCALC       | NEW | MAXPOOLMEM  | 32768     | SAVEMATRIX | ON       |
| BYPANELING    | OFF | MDIBINS     | 8000      | TCPIPINT   | OFF      |
| CACHE         | 0   | MDIPROGRESS | 100000    | TEMP DISK  | A        |
| COLUMNSCROLL  | OFF | MODE        | CMS       | TRMSD      | 24       |
| DATEDISPLAY   | OFF | MPRINT      | NEW       | TRMSW      | 80       |
| DATEFNS       | ON  | POOL        | OFF       | TRMTYP     | 1 (3270) |
| DEFCENT       | 19  | POOLBATCH   | OFF       | WEBHOME    | OFF      |
| EUROFILE      |     | POOLFEATURE | OFF       | WIDTH      | 130      |
| FIELDNAME     | NEW | POOLMEMORY  | 16384     | WINPFKEY   | OLD      |
| FOCSTACK SIZE | 8   | POOLRESERVE | 1024      | YRTHRESH   | 0        |
| HTMLMODE      | OFF | PRINTPLUS   | OFF       |            |          |

>

The preceding screen shows a list of parameters that are not settable using ON TABLE.

## NF740: Changes to the REBUILD Prompt

With the addition of two new options, MIGRATE and MDINDEX, the REBUILD prompt no longer fits on one line. After you enter REBUILD at the FOCUS prompt a numbered list is displayed that allows you to enter either the option name or its corresponding number.

### Syntax The REBUILD Prompt Screen

```
>REBUILD
Enter option
1. REBUILD (Optimize the database structure)
2. REORG (Alter the database structure)
3. INDEX (Build/modify the database index)
4. EXTERNAL INDEX (Build/modify an external index database)
5. CHECK (Check the database structure)
6. TIMESTAMP (Change the database timestamp)
7. DATE NEW (Convert old date formats to smartdate formats)
8. MDINDEX (Build/modify a multidimensional index. FUSION DBs only)
9. MIGRATE (Convert FOCUS masters/DBs to FUSION)
```

**Note:** A change was also made to the FILENAME prompt. Instead of prompting for the name of the FOCUS file, you are now asked for the FOCUS/FUSION filename. Within the individual options a similar numbered list is also displayed if applicable. REBUILD commands are stackable in name or number format.

## NF745: ? PTF Enhancements

Two columns have been added to the output displayed in response to ? PTF. They are, SUPERSEDED BY, which displays a superseding PTF if one exists and PUT LEVEL, which demonstrates the order in which multiple PTFs must be applied..

### Syntax How to Identify PTFs Applied to Your Version of FOCUS

Issue the following command at the FOCUS prompt:

```
? PTF
```

A screen similar to the following is displayed:

```
>
? ptf
PTFS APPLIED TO RELEASE 70XFOC
FROM PTFTABLE LOCATED IN IBITEST LOADLIB C1
```

| COUNT | PTF NUM | CREATED  | APPLIED  | SUPERSEDED BY | PUT LEVEL |
|-------|---------|----------|----------|---------------|-----------|
| ----- |         | -----    | -----    | -----         | -----     |
| 1)    | 95828   | .....    | .....    | 112600        | .....     |
| 2)    | 107164  | .....    | .....    | 112600        | .....     |
| 3)    | 110763  | .....    | .....    | 112600        | .....     |
| 4)    | 112600  | 19990427 | 19990513 | .....         | 200295    |

```
>
```

**Note:** Dots denote that no information exists for a column entry in the resulting report.

## NF746: Leading Zeros

This feature may be used in Dialogue Manager for date subroutines that return a numeric integer format. It specifically addresses the case where a two-digit year is input in a Dialogue Manager string. The result of the subroutine is 00, representing the year 2000. The leading zeros are truncated when typed out.

### Syntax    Displaying Leading Zeros

```
SET LEADZERO = {ON|OFF}
```

where:

ON

Allows the display of leading zeros if they are present.

OFF

Truncates leading zeros if they are present.

### Example Preserving Leading Zeros

In the following example the AYM subroutine is being called. The input year is 99 and the month is 12.

```
-SET &IN = '9912';
-SET &OUT = AYM (&IN, 1, 'I4');
-TYPE &OUT
```

This yields

1

Adding

```
SET LEADZERO = ON
```

before the above example yields

0001

correctly indicating January. 2000.

**Note:** LEADZERO only supports expressions that make a direct call to a subroutine. Expressions that have nesting or other mathematical functions truncate leading zeros. For example,

```
-SET &OUT = AYM(&IN, 1, 'I4'/100;
```

## NF748: HOLD FORMAT WP With Carriage Control

You can now control whether carriage control characters appear in column 1 of each page of report output saved with the HOLD FORMAT WP option. When you choose to include carriage control in a format WP file in MVS, FOCUS creates the file with RECFM VBA so that each report page prints on a separate sheet of paper.

### Syntax    How to Include Carriage Control Characters in a FORMAT WP Hold File

```
[ON TABLE] HOLD AS filename FORMAT WP [CC|NOCC]
```

where:

*filename*

Is the name of the resulting file.

CC

Includes a carriage control character (1) as the first character of each report page in the extract file. In MVS, the file is created with RECFM VBA which causes the operating system to respect the carriage control via page ejects.

NOCC

Omits carriage control characters from the extract file. The file is created with RECFM VB.

When you do not include either CC or NOCC in the syntax, the value of the PAGE-NUM (or PAGE) parameter controls whether carriage control characters are supplied in column 1:

- SET PAGE-NUM=ON (the default) or SET PAGE-NUM=NOPAGE causes column 1 to be blank (no carriage control). In MVS, the file is created with RECFM=VB.
- SET PAGE-NUM=OFF, SET PAGE-NUM=TOP, or using the TABPAGENO option in the heading of the report request supplies carriage control characters. This is the same as prior behavior. However, starting with this release, these settings cause the Hold file to be created with RECFM VBA in MVS.

### Reference Directing Output to a Printer

In MVS, you can send the format WP output directly to a printer by allocating the filename to that printer. You must FREE or CLOSE the file after it is created and before it is printed. For example:

```
SET PAGE = ON
DYNAM ALLOC FILE EMPLOYEE DA PREFIX.EMPLOYEE.FOCUS SHR REU
DYNAM FREE FILE HOLD1
DYNAM ALLOC FILE HOLD1 SYSOUT A DEST IBIVM.P29C1 CLOSE REUSE
TABLE FILE EMPLOYEE
PRINT EMP_ID
BY CURR_SAL BY LAST_NAME
ON TABLE HOLD AS HOLD1 FORMAT WP CC
END
```

**Note:** Your SYSOUT allocation must contain your destination printer.



In VM/CMS, print the HOLD file using the CC option of the CMS PRINT command to interpret the first character of each record as a carriage control character.

```
PRINT fn ft fm (cc
```

**Reminder:** If the HOLD file is created with carriage control, it must be printed with carriage control.

## **Reference** **FORMAT WP Carriage Control and MVS Record Format Options**

The following table summarizes the options for creating a FORMAT WP extract file:

| <b>Carriage Control Option</b> | <b>PAGE=ON or NOPAGE</b> |                  | <b>PAGE=OFF or TOP or TABPAGENO in heading</b> |                  |
|--------------------------------|--------------------------|------------------|------------------------------------------------|------------------|
|                                | <b>Carriage Control?</b> | <b>MVS RECFM</b> | <b>Carriage Control?</b>                       | <b>MVS RECFM</b> |
| CC                             | Yes                      | VBA              | Yes                                            | VBA              |
| NOCC                           | No                       | VB               | No                                             | VB               |
| none                           | No                       | VB               | Yes                                            | VBA              |

## 7.0.8R New Features

### Year 2000

#### FOCUS

NF557: REBUILD - Legacy Date Conversion

NF653: Displaying Base Dates in FOCUS Reports

NF659: CHECK FILE HOLD ALL

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NF708: Enhancement to the TODAY Subroutine

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NF710: Field FORMAT=YYJUL

NF711: Altering Your System Date for Testing Purposes

NF713: MSO Log Changes

#### General Enhancements

NF714: LE Support

## NF557: REBUILD - Legacy Date Conversion

A new option has been added to REBUILD for legacy date conversion. The option DATE NEW converts legacy dates to smart dates in your FOCUS databases. The utility uses 'update-in-place' technology. It updates your database and creates a new Master File, yet does not change the structure or size of the database.

You must backup the database before executing REBUILD with the DATE NEW option. We recommend that you run the utility against the copy and then replace the original file with the updated backup.

### How the REBUILD Utility Converts Legacy Dates

The utility overwrites the original legacy date field with a smart date. When the storage size of the legacy date exceeds four bytes (the storage size of a smart date), a pad field is added to the database following the date field. Formats A6YMD, A6MDY, and A6DMY are changed to formats YMD, MDY, and DMY, respectively, and have a two-byte pad field added to the Master File. The storage size of integer dates (I6YMD, I6MDY, for example) is four bytes, so no pad field is added. All packed fields and A8 dates add a four-byte pad field. When a date is a key field (but not the last key for the segment), and it requires a pad field, the number of keys in the SEGTYPE is increased by one for each date field that requires padding.

The utility only changes legacy dates to smart dates. The FORMAT in the Master File must be one of the following (Month translation edit options T and TR may be included in the format):

A8YYMD A8MDYY A8DMYY A6YMD A6MDY A6DMY A6YYM A6MYM A4YM A4MY  
I8YYMD I8MDYY I8DMYY I6YMD I6MDY I6DMY I6YYM I6MYM I4YM I4MY  
P8YYMD P8MDYY P8DMYY P6YMD P6MDY P6DMY P6YYM P6MYM P4YM P4MY

If you have a field that stores date values but does not have one of these formats, the utility does not change it. If you have a date with one of these formats that you do not want changed, temporarily remove the date components from the FORMAT, run the REBUILD, and then restore the date format.

### Example Using REBUILD With the DATE NEW Option

```
let clear *
set defcent = 19
set yrthresh = 50
set pass = dohide
use
employee focus f
end
rebuild
ENTER OPTION (REBUILD,REORG,INDEX,EXTERNAL INDEX,CHECK OR TIMESTAMP,DATE
NEW)
date new
ENTER THE NAME OF THE MASTER
employee
ENTER THE NEW NAME FOR THE MASTER (FN FT FM)
newemp master a
HAVE YOU BACKED UP THE DATABASE? (YES,NO)
yes
```

If you answer anything other than YES to 'HAVE YOU BACKED UP THE DATABASE', the REBUILD does not continue. Backing up your database is critical to this process.

In CMS, the new Master File is written to the file that you specified in the prompt. The default filetype is MASTER, and the default filemode is A.

In MVS, the new Master File is written to *ddname* HOLDMAST. After the new Master File is created, you should immediately copy it to a permanent dataset.

For example:

```
DYNAM COPYDD HOLDMAST(newname) MASTER(newname)
```

### Notes:

- The DBA password for the file must be issued prior to issuing REBUILD.
- The original Master File cannot be encrypted.
- All files must be available locally during the REBUILD, including LOCATION files.
- The Master File cannot have GROUP fields.
- Some error numbers are available in &FOCERRNUM while all error numbers are available in &&FOCREBUILD. Test both &&FOCREBUILD and &FOCERRNUM for errors when writing procedures to rebuild your files.
- To avoid any potential problems, clear all LETs and JOINS before issuing REBUILD.
- DEFCENT/YRTHRESH are respected at the global, file, and field level.
- Correct all invalid date values in the database before executing REBUILD/DATE NEW. The utility converts all invalid dates to zero. Invalid dates used as keys may lead to duplicate keys in the database.

- Adequate workspace, such as temporary attached disk storage, must be available for the temporary REBUILD file. As a rule of thumb, have space 10 to 20% larger than the size of the existing file available.
- REBUILD/INDEX is performed automatically if an index exists.
- REBUILD/REBUILD is performed automatically after REBUILD/DATE NEW when any key is a date.
- Sort libraries and workspace must be available (as with REBUILD/INDEX). The REBUILD allocates default sortwork space in MVS, if you have not already. DDNAMEs SORTIN and SORTOUT must be allocated prior to issuing a REBUILD:

```
DYNAM ALLOC FILE SORTIN SPACE 5,5 TRACKS NEW
DYNAM ALLOC FILE SORTOUT SPACE 5,5 TRACKS NEW
DYNAM ALLOC FILE SYSOUT DA * MOD
```

## Restrictions

REBUILD DATE NEW is a remediation tool for your FOCUS databases and date fields only. It does not remediate:

- DEFINES in the Master File
- ACCEPTS in the Master File
- DBA restrictions (especially VALUE restrictions) in the Master File or DBAFILE
- Cross-references to other date fields in this or other Master Files.
- Any references to date fields in your application (FOCEXECs, Master Files).

## **Updated Master File Created by REBUILD/DATE NEW**

The REBUILD/DATE NEW utility creates an updated Master File that reflects the changes made to the database. Once the file has been rebuilt, the original Master File can no longer be used against the database. You must use the new Master File created by the REBUILD/DATE NEW utility.

For example:

```
USE
EMPLOYEE {FOCUS F} AS NEWEMP
END
REBUILD
DATE NEW
EMPLOYEE
NEWEMP
YES
-RUN
-IF (&FOCREBUILD NE 0)OR(&FOCERRNUM NE 0) GOTO error_case;
USE
EMPLOYEE {FOCUS F} AS NEWEMP
END
TABLE FILE NEWEMP
PRINT
END
```

The new Master File is an updated copy of the original Master File except:

- The USAGE format for legacy date fields is updated to remove the format and length. The date edit options are retained. For example A6YMDTR becomes YMDTR.

- Padding fields are added for those dates that need them:

`FIELDNAME= ,ALIAS= ,FORMAT=An,$ PAD FIELD ADDED BY REBUILD`

where *n* is the padding length (either 2 or 4). Note that the FIELDNAME and ALIAS are blank.

- The SEGTYPE attribute is updated for segments that have remediated dates as keys when the date requires padding and the date is not the last field in the key. The SEGTYPE number will be increased by the number of pad fields added to the key.
- If the SEGTYPE is missing for any segment, the following line is added immediately prior to the \$ terminator for that segment:

`SEGTYPE=segtype,$ OMITTED SEGTYPE ADDED BY REBUILD`

where *segtype* is determined by FOCUS.

- If the USAGE for any field, including date fields is missing, the following line is added, immediately prior to the \$ terminator for that field:

`USAGE=fmt,$ OMITTED USAGE ADDED BY REBUILD`

where *fmt* is the format of the previous field in the Master File. FOCUS automatically assigns the previous field's format to any field coded without an explicit USAGE= statement.



## Example Sample Master File: Before and After Conversion

| Before Conversion                 | After Conversion                                   |
|-----------------------------------|----------------------------------------------------|
| FILE=filename                     | FILE=newfilename                                   |
| SEGNAME=segname,<br>SEGTYPE=S2    | SEGNAME=segname, SEGTYPE=S3                        |
| FIELD=KEY1,,USAGE=A6YMD,\$        | FIELD=KEY1,,USAGE= YMD,\$                          |
|                                   | FIELD=, ,USAGE=A2,\$ PAD FIELD ADDED BY<br>REBUILD |
| FIELD=KEY2,,USAGE=I6MDY,\$        | FIELD=KEY2,,USAGE= MDY,\$                          |
| FIELD=FIELD3,,USAGE=A8YYMD<br>,\$ | FIELD=FIELD3,,USAGE= YYMD,\$                       |
|                                   | FIELD=, ,USAGE=A4,\$ PAD FIELD ADDED BY<br>REBUILD |

In the conversion of the Master File:

- The SEGTYPE changes from an S2 to S3 to incorporate a 2-byte pad field.
- Format A6YMD changes to smart date format YMD.
- A 2-byte pad field with a blank fieldname and alias is added to the Master File.
- Format I6MDY changes to smart date format MDY (no pad needed).
- Format A8YYMD changes to smart date format YYMD.
- A 4-byte pad field with a blank fieldname and alias is added to the Master File.

## Action Taken on a Date Field During REBUILD/DATE NEW

A new message has been added after a REBUILD has been performed:

NUMBER OF SEGMENTS CHANGED=  $n$

where:

$n$  is the number of segments that have been changed. For example, if there are 10 fields on one segment, and 20 records, then  $n$  is 20 (the number of records/segments changed).

REBUILD/DATE NEW performs a REBUILD/REBUILD or REBUILD/INDEX automatically when a date field is a key or a date field is indexed. The following chart shows the action taken on a date field during the REBUILD/DATE NEW process.

| Date is a Key | Index        | Result                                                                              |
|---------------|--------------|-------------------------------------------------------------------------------------|
| No            | None         | NUMBER OF SEGMENTS CHANGED = $n$                                                    |
| No            | Yes          | REBUILD/INDEX on date field                                                         |
| Yes           | None         | REBUILD/REBUILD is performed.                                                       |
| Yes           | On Any field | REBUILD/REBUILD is performed.<br>REBUILD/INDEX is performed for the indexed fields. |

## **REBUILD/DATE NEW Error Messages**

40001 - THIS UTILITY IS NOT SUPPORTED ON THIS PLATFORM  
40002 - FILE NOT BACKED UP - REBUILD NOT EXECUTED  
40003 - THERE ARE NO DATE FIELDS IN THE FILE - REBUILD NOT EXECUTED  
40004 - FILE CONTAINS GROUP FIELDS - REBUILD NOT EXECUTED  
40005 - COMBINE FILE CANNOT BE REBUILT  
40006 - INTERNAL ERROR IN REBUILD/DATE NEW  
40007 - NEW MASTER NAME MUST BE DIFFERENT THAN THE ORIGINAL

## NF653: Displaying Base Dates in FOCUS Reports

You can now display base dates in a FOCUS report. Previously, TABLE always displayed a blank when:

- A date read from a file matched the base date, or
- A field with a smart date format had the value 0

The following chart shows the base date for each supported date format:

| FORMAT        | Base Date                        |
|---------------|----------------------------------|
| YMD and YYMD  | 1900/12/31                       |
| YM and YYM    | 1901/01                          |
| YQ and YYQ    | 1901/Q1                          |
| JUL and YYJUL | 00/365 and 1900/365 respectively |

### Syntax Invoking DATEDISPLAY

SET DATEDISPLAY={ON|OFF}

where:

ON

Displays the base date if the data is the base date value.

OFF

Displays blanks if the data is the base date value. OFF is the default.

You cannot set DATEDISPLAY with the ON TABLE command.

## NF659: CHECK FILE HOLD ALL

CHECK FILE HOLD has been enhanced so you can view all of the attributes in a HOLD file including YRTHRESH and DEFCENT. The HOLD file contains two new columns with the values of FDEFCENT and FYRTHRESH at the file level and two new columns with the values of DEFCENT and YRTHRESH at the field level.

The syntax is:

```
CHECK FILE filename HOLD ALL
```

where

*filename*

Is the name of the file whose Master specifications are to be placed in a HOLD file

Then issue the following to see the data about the Master:

```
TABLE FILE HOLD
PRINT *
END
```

Running this report request displays columns FDEFCENT and FYRTHRESH at the file level,

| FDEFCENT | FYRTHRESH |
|----------|-----------|
| -----    | -----     |
| 19       | 50        |
| 19       | 50        |

and columns DEFCENT and YRTHRESH at the field level.

| DEFCENT | YRTHRESH |
|---------|----------|
| -----   | -----    |
| 19      | 60       |
| 19      | 50       |

The four columns shown in the previous two examples represent a small portion of the total information displayed by the TABLE FILE HOLD command.

## NF700: New Date Math Functions for the Year 2000

Several functions have been added to FOCUS enabling you to perform operations on day-based **new dates** in DEFINES, COMPUTEs and anywhere else a function can be used.

### New Date Function Capabilities

The new date functions can:

- Add or subtract date units (months, years, days, weekdays or business days) to or from a date
- Yield a difference between dates in date units
- Move a date to a specific point in the calendar, such as End-of-Month
- Convert from one date format to another (including old dates)

These new functions can help you:

- Compute payroll dates
- Track and ship orders
- Ensure correct credit card transactions

Non day-based date calculations (for example, YM, YQ) can be computed in direct operations (+, -), so they do not need these functions.

### Syntax Adding and Subtracting Date Units to or from a Date

You can add or subtract date units to or from a date by issuing the following:

```
DATEADD (YYMDdate, 'unit', #units)
```

where

*YYMDdate*

Is any day-based new date, for example, YYMD, MDY, or JUL

*unit*

Can be one of the following:

- Y (Year)
- M (Month)
- D (Day)
- WD (Weekday)
- BD (Business Day)

*#units*

Is the number of date units you wish to add or subtract to or from the day-based new date

For example,

```
DATE/YYMD = '19991231';
```

```
NEWDATE/YYMD = DATEADD (DATE, 'D', 5);
```

adds 5 days to yield a value of 2000/01/05

The number of units passed to DATEADD is always a whole unit. For example,

```
DATEADD (date, 'M', 1.999)
```

adds 1 month because the number of units is less than 2. Any fractional part is ignored. If the number of units is negative, DATEADD performs subtraction instead of addition.

Invalid date units result in a zero being returned.



If the result of adding months creates an invalid day in the new month, the day is backed off to the end of the resultant month. For example, adding one month to March 31st cannot yield April 31st. Instead, it correctly yields April 30th. The same is true for adding one month to January 29th, 30th, or 31st. All three result in the last day of February (28th, or 29th if a leap year). DATEADD works with smart dates only.

The following uses DATEADD to determine whether a date is a business day:

```
SET EMPTYREPORT=ON
DEFINE FILE DATE
 X/YYMD=DATEADD(D1_YYMD, 'BD', 0);
END
TABLE FILE DATE
HEADING
" USE DATEADD TO DETERMINE WHETHER A SMARTDATE FIELD IS A BUSINESS "
" DAY. THE DATABASE HAS THE DATE '1998/06/05' WHICH IS A FRIDAY "
" STORED IN FIELD D1_YYMD. AN IF TEST IS USED TO DETERMINE IF THE "
" DATE CORRESPONDS TO A BUSINESS DAY. "
 PRINT D1_YYMD X
 IF X EQ '19980605'
END
TABLE FILE DATE
HEADING
" IT WILL YIELD 0 RECORDS 0 LINES IF THE RESULTING DATE IS NOT A "
" A BUSINESS DAY. THE DATABASE ALSO HAS '1998/06/06, A SATURDAY. "
 PRINT D1_YYMD X
 IF X EQ '19980606'
END
```

The preceding FOCEXEC yields the following:

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```
USE DATEADD TO DETERMINE WHETHER A SMARTDATE FIELD IS A BUSINESS
DAY. THE DATABASE HAS THE DATE '1998/06/05' WHICH IS A FRIDAY
STORED IN FIELD D1_YYMD. AN IF TEST IS USED TO DETERMINE IF THE
DATE CORRESPONDS TO A BUSINESS DAY.
```

```
D1_YYMD X
----- -
1998/06/05 1998/06/05
```

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```
IT WILL YIELD 0 RECORDS 0 LINES IF THE RESULTING DATE IS NOT A
A BUSINESS DAY. THE DATABASE ALSO HAS '1998/06/06', A SATURDAY.
```

```
D1_YYMD X
----- -
```

## **Weekday Units**

Weekday units (WD), by default, refer to Monday through Friday. One weekday past a Friday is the following Monday. If the input to DATEADD using WD is a Saturday or Sunday, the input is adjusted to the next weekday before doing the addition. For example,

```
DATEADD (Saturday, 'WD', 1)
```

and

```
DATEADD (Sunday, 'WD', 1)
```

both yield Tuesday as a result because Saturday and Sunday are not business days, so DATEADD begins with Monday and adds 1, yielding Tuesday.

## Business Day Units

You can direct which days are considered business days and which days are not. Business days are traditionally Monday through Friday, but not every business works the same schedule. For example, if your company does business on Sunday, Tuesday, Wednesday, Friday, and Saturday, you can tailor business day units to reflect that situation. Issue the following positionally dependent command to set business days:

```
SET BUSDAYS = {day-list|_MTWTF_}
```

where

`day-list`

is the list of days that represents your business week. The list has a position for each day from Sunday to Saturday.

`_MTWTF_`

Represents the positional days of the week from Sunday through Saturday. The underscores represent Sunday and Saturday respectively. Monday through Friday with an underscore before and an underscore afterwards is the default.

Any day that you do not wish to designate as a business day must be replaced with an underscore ( `_` ) in its designated space. If any position within `SMTWTF_S` is either not in its correct position or is not an underscore, an error message is displayed. Using the example of a company that does business on Sunday, Tuesday, Wednesday, Friday and Saturday, business days are represented as:

`S_TW_FS`

To view the current setting of business days issue:

```
? SET ALL or ? SET
```

## Holidays

You also have the ability to individually tailor holiday schedules that affect the calculation of business days by skipping those days when calculating offsets. For example, in a given week, if Friday is designated as a holiday, the next business day (BD) after Thursday is the following Monday. In MVS the list of holidays is loaded from a member in ERRORS called HDAYxxxx. In CMS the list is loaded from HDAYxxx ERRORS. A sample Master File, (HDAYDB), and FOCEXEC, (HDAYMAKE), that creates an errors member from a data source used to maintain a list of holidays is available on the FOCUS disk. Create a flat file of holidays as described in the FOCEXEC and execute the FOCEXEC to create the holiday file. The value of xxxx is controlled by the SET HDAY command so that a single installation can support different holiday schedules.

For example,

```
SET HDAY = STKM
```

Reads in the holidays from member HDAYSTKM. Each year for which data exists must be represented in the holiday file. Calling a date function with a date value outside the range of the holidays file returns a zero on BD requests. The current setting of HDAY can be viewed with

```
? SET ALL or ? SET
```

## Syntax    Returning the Difference between Two Dates

You can return the difference between two dates by issuing the following:

```
DATEDIF (fromYYMD, toYYMD, 'unit')
```

where

*fromYYMD*

Is the starting date from which to calculate the difference

`toYYMD`

Is the ending date from which to calculate the difference

`unit`

See *Adding and Subtracting Date Units to or from a Date* for valid units

The number of units returned from DATEDIF is always a whole number. For example,

```
DATEDIF (19960302,19970301,'Y')
```

DATEDIF calculates to zero because the difference between March 2, 1996 and March 1, 1997 is less than a whole year. If the to-date is before the from-date, a negative number is returned. For example,

```
DATEDIF (19990228, 19990128, 'M')
```

```
DATEDIF (19990228, 19990129, 'M')
```

```
DATEDIF (19990228, 19990130, 'M')
```

```
DATEDIF (19990228, 19990131, 'M')
```

all return a result of minus 1 month.

Using DATEDIF with month units yields the inverse of DATEADD. If adding one month to date X creates date Y, then the count of months via DATEDIF between date X and date Y must be one month. The rule is:

If the to-date is an end-of-month then the month difference may be rounded up (in absolute terms) to guarantee the inverse rule. For example,

```
DATEDIF (March31, May31, 'M') yields 2
```

```
DATEDIF (March31, May30, 'M') yields 1 (because May 30 is not the end of the month)
```

```
DATEDIF (March31, April30, 'M') yields 1
```

The same rules apply to year math, the only difference being that February 29th plus 1 year is equal to February 28th.

DATEDIF works with smart dates only.

## Syntax Moving a Date to a Significant Point

You can move a date to a significant point on the calendar by issuing the following:

```
DATEMOV (YYMDate, 'move-point')
```

where

*YYMDate*

Is the date you wish to move. May be any new date format as long as it implies a day component ( for example MDYY, DMY, but not YM or MYY).

*move-point*

Is the significant point to which you wish to move. Permissible move-points are:

- EOM End of month
- BOM Beginning of month
- EOQ End of quarter
- BOQ Beginning of quarter
- EOY End of year
- BOY Beginning of year
- EOW End of week
- BOW Beginning of week
- NWD Next weekday
- NBD Next business day (Affected by BUSDAY and HDAY files)
- PWD Prior weekday
- PBD Prior business day (Affected by BUSDAY and HDAY files)
- WD- A weekday or earlier

- BD- A business day or earlier (Affected by BUSDAY and HDAY files)
- WD+ A weekday or later
- BD+ A business day or later (Affected by BUSDAY and HDAY files)

DATEMOV works with smart dates only.

The following shows an application using DATEMOV and the report it produces

```
DEFINE FILE CAR
ANUM/I5 WITH COUNTRY = ANUM +1;
ADATEX/YYMD WITH COUNTRY = 19980507;
ADATE/YMD = ADATEX + ANUM;
NWD/YMDWT = DATEMOV(ADATE,'NWD');
PWD/YMDWT = DATEMOV(ADATE,'PWD');
WDP/YMDWT = DATEMOV(ADATE,'WD+');
WDM/YMDWT = DATEMOV(ADATE,'WD-');
NBD/YMDWT = DATEMOV(ADATE,'NBD');
PBD/YMDWT = DATEMOV(ADATE,'PBD');
WBP/YMDWT = DATEMOV(ADATE,'BD+');
WBM/YMDWT = DATEMOV(ADATE,'BD-');
END
SET BUSDAY = _MTWT___
TABLE FILE CAR
HEADING
"EXAMPLES OF DATEMOV"
"BUSINESS DAYS ARE MONDAY, TUESDAY, WEDNESDAY, + THURSDAY "
" "
"START DATE.. 3 MOVE POINTS....."
PRINT ADATE/WT AS 'DOW'
NWD/WT PWD/WT WDP/WT AS 'WD+' WDM/WT AS 'WD-'
NBD/WT PBD/WT WBP/WT AS 'BD+' WBM/WT AS 'BD-'
BY ADATE
END
```

yields:

EXAMPLES OF DATEMOV

BUSINESS DAYS ARE MONDAY, TUESDAY, WEDNESDAY, + THURSDAY

| START DATE.. | MOVE | POINTS..... |     |     |     |     |     |     |     |
|--------------|------|-------------|-----|-----|-----|-----|-----|-----|-----|
| ADATE        | DOW  | NWD         | PWD | WD+ | WD- | NBD | PBD | BD+ | BD- |
| -----        | ---  | ---         | --- | --- | --- | --- | --- | --- | --- |
| 98/05/08     | FRI  | MON         | THU | FRI | FRI | TUE | WED | MON | THU |
| 98/05/09     | SAT  | TUE         | THU | MON | FRI | TUE | WED | MON | THU |
| 98/05/10     | SUN  | TUE         | THU | MON | FRI | TUE | WED | MON | THU |
| 98/05/11     | MON  | TUE         | FRI | MON | MON | TUE | THU | MON | MON |
| 98/05/12     | TUE  | WED         | MON | TUE | TUE | WED | MON | TUE | TUE |

Invalid move-points result in a zero being returned.

## Syntax Converting From One Date Format to Another

Applications no longer have to use intermediate calculations to convert date formats. Instead you can issue the following:

```
DATECVT (indate, 'infmt', 'outfmt')
```

where

*indate*

Is the date whose format you wish to change

*infmt* and *outfmt*

Can be:

- Any new date format (for example, YYMD, YQ, M, DMY, JUL) that matches the format of *indate*. It can also be in the format of the output value enclosed within single quotes.



- Any old date format (such as I6YMD or A8MDYY)
- Non-date formats (such as I8, or A6). Non-date formats on infmt are treated as offsets from the base date (12/31/1900). Use the DAYMD function to retrieve the offset of a date.

The format of the field on the left side of the equal sign must match the outfmt value. For example,

```
field/DMY = DATECVT (indate, 'YYMD', 'DMY');
```

If the value of indate is 19991231 then the field is set to the offset, which is 311299. Indates with old formats obey any DEFCENT and YRTHRESH values implied for that field when performing the conversion.

Invalid old dates passed to DATECVT cause a zero to be returned as does a DEFINE. Invalid formats in DATECVT cause a zero or blank to be returned.

## **New Date Math Functions in MAINTAIN**

MAINTAIN supports the new date functions DATEADD, DATEDIF, and DATEMOV with an extra parameter: the result field. In MAINTAIN, you can code:

```
COMPUTE ADATE/YYMD = ... (some expression)
COMPUTE DUE_DATE/YYMD = DATEADD(ADATE, 'BD', 20, DUE_DATE);
COMPUTE NOTICE_DATE/YYMD = DATEMOV(DUE_DATE+1, 'EOM', NOTICE_DATE);
COMPUTE TOTAL_DAY/I4 = DATEDIF(ADATE, NOTICE_DATE, 'BD', TOTAL_DAY);
```

DATECVT is not supported in MAINTAIN. If you attempt to use DATECVT in MAINTAIN the following message displays:

```
FUNCTION NOT FOUND ERROR
```

## NF703: Displaying Invalid Smart Dates in Reports

In previous releases of FOCUS, if a date field in a non-FOCUS file contained an invalid date, a diagnostic error was displayed and the entire record failed to display in a report. For example, if a date field contained '980450' with an ACTUAL of A6 and a USAGE of YMD, the record containing that field would not display. With the use of a new command, it is possible to display the rest of the record that contains the incorrect date.

### Syntax Invoking ALLOWCVTERR

```
SET ALLOWCVTERR = {ON|OFF}
```

where

ON

Allows the display of a field containing an incorrect date.

OFF

Generates an error if bad data is encountered, and does not display the record containing the bad data. This behavior is identical to releases prior to FOCUS Release 7.0.8R.

When it encounters a bad date, ALLOWCVTERR sets the value of the field to either MISSING or to the base date. When a field is being converted and ALLOWCVTERR is set on, FOCUS first checks to see if MISSING=ON.

The following chart shows the results of interaction between DATEDISPLAY and MISSING assuming ALLOWCVTERR=ON and the presence of a bad date.

|                 | MISSING=OFF                              | MISSING=ON |
|-----------------|------------------------------------------|------------|
| DATEDISPLAY=ON  | Displays Base Date<br>19001231 or 1901/1 | .          |
| DATEDISPLAY=OFF | Displays Blanks                          | .          |

DATEDISPLAY only affects how the base date is displayed.

**Note:** See New Feature Bulletin 653, *Displaying Base Dates in FOCUS Reports*, for detailed information concerning the setting of DATEDISPLAY.

## NF705: Enhancement to the YRTHRESH Command

You can now set YRTHRESH as an offset from the current year in addition to specifying a year. This technique creates a moving century window that increments itself each year without modifying your application.

You decide the number of years to offset in YRTHRESH. For example, if the current year is 1998 and you wish to set YRTHRESH to 60, you can set YRTHRESH to -38 ( $1998 - 38 = 60$ ). By setting YRTHRESH to a negative number FOCUS subtracts, in this example, 38 from whatever the current year is. In the year 1999 YRTHRESH is 61 instead of 60 ( $1999 - 38 = 61$ ) illustrating how the moving window application functions without outside intervention.

If you set YRTHRESH to a large enough value that crosses a century boundary, the value of DEFCENT is recalculated. For example, if you set YRTHRESH to minus 99 ( $1998 - 99 = -1$ ), DEFCENT is calculated to 18 and YRTHRESH becomes 99. The 100- year span begins with a pivot year of 1899 and ends with year 1998. ? SET and ? SET ALL now reflect the new settings of DEFCENT.

The following request shows the use of an offset with DEFCENT set to 19 and YRTHRESH set to -38 (where the current year is 1998), followed by the output:

```
SET DEFCENT=19, YRTHRESH=-38
TABLE FILE DATE
PRINT D2_I6YMD AND COMPUTE
NEWDATE/I8YYMD=AYMD(D2_I6YMD,1,NEWDATE);
END
```

## NF705: Enhancement to the YRTHRESH Command

---

| D2_I6YMD | NEWDATE    |
|----------|------------|
| -----    | -----      |
| 60/04/02 | 1960/04/03 |
| 66/06/06 | 1966/06/07 |
| 60/12/13 | 1960/12/14 |
| 53/06/06 | 2053/06/07 |
| 59/08/11 | 2059/08/12 |
| 60/02/28 | 1960/02/29 |

## NF708: Enhancement to the TODAY Subroutine

The TODAY subroutine is year 2000 compatible and is useful in a compiled MODIFY. It can return a 4-digit year when you declare a DEFINE or COMPUTE field as 10 bytes. TODAY can continue returning a 2-digit year when you declare the output format as 8 bytes.

For example,

```
DEFINE FILE EMPLOYEE
NOWDATE/A10 WITH EMP_ID = TODAY (NOWDATE)
END
TABLE FILE EMPLOYEE
HEADING
"SALARY REPORT RUN ON DATE <NOWDATE>"
" "
PRINT DEPARTMENT CURR_SAL
BY LAST_NAME BY FIRST_NAME
END
```

The DEFINE may also be coded as

```
NOWDATE/A10 WITH EMP_ID = TODAY('A10');
```

The request produces the following report:

| SALARY REPORT RUN ON DATE 06/08/1998 |            |            |             |
|--------------------------------------|------------|------------|-------------|
| LAST_NAME                            | FIRST_NAME | DEPARTMENT | CURR_SAL    |
| -----                                | -----      | -----      | -----       |
| BANNING                              | JOHN       | PRODUCTION | \$29,700.00 |
| BLACKWOOD                            | ROSEMARIE  | MIS        | \$21,780.00 |
| CROSS                                | BARBARA    | MIS        | \$27,062.00 |
| GREENSPAN                            | MARY       | MIS        | \$9,000.00  |
| IRVING                               | JOAN       | PRODUCTION | \$26,862.00 |
| JONES                                | DIANE      | MIS        | \$18,480.00 |
| MCCOY                                | JOHN       | MIS        | \$18,480.00 |
| MCKNIGHT                             | ROGER      | PRODUCTION | \$16,100.00 |
| ROMANS                               | ANTHONY    | PRODUCTION | \$21,120.00 |
| SMITH                                | MARY       | MIS        | \$13,200.00 |
|                                      | RICHARD    | PRODUCTION | \$9,500.00  |
| STEVENS                              | ALFRED     | PRODUCTION | \$11,000.00 |

**Note:** DATEFNS must be set to ON to retrieve the extended TODAY value.

## NF709: Displaying a Date Variable Without Separators

You can now display a date variable containing a 4-digit year without separators. The variables are &YYMD, &MDYY and &DMYY. These variables complement the existing 2-digit year variables &YMD, &MDY, and &DMY.

The following example shows a report using &YYMD:

```
TABLE FILE EMPLOYEE
HEADING
"SALARY REPORT RUN ON DATE &YYMD"
" "
PRINT DEPARTMENT CURR_SAL
BY LAST_NAME BY FIRST_NAME
END
```



The resulting output for May 18, 1998 is:

---

SALARY REPORT RUN ON DATE 19980518

---

| LAST_NAME | FIRST_NAME | DEPARTMENT | CURR_SAL    |
|-----------|------------|------------|-------------|
| -----     | -----      | -----      | -----       |
| BANNING   | JOHN       | PRODUCTION | \$29,700.00 |
| BLACKWOOD | ROSEMARIE  | MIS        | \$21,780.00 |
| CROSS     | BARBARA    | MIS        | \$27,062.00 |
| GREENSPAN | MARY       | MIS        | \$9,000.00  |
| IRVING    | JOAN       | PRODUCTION | \$26,862.00 |
| JONES     | DIANE      | MIS        | \$18,480.00 |
| MCCOY     | JOHN       | MIS        | \$18,480.00 |
| MCKNIGHT  | ROGER      | PRODUCTION | \$16,100.00 |
| ROMANS    | ANTHONY    | PRODUCTION | \$21,120.00 |
| SMITH     | MARY       | MIS        | \$13,200.00 |
|           | RICHARD    | PRODUCTION | \$9,500.00  |
| STEVENS   | ALFRED     | PRODUCTION | \$11,000.00 |

---

## NF710: Field FORMAT=YYJUL

A new date field formatting option, FORMAT=YYJUL, lets you print a Julian date in the format YYYY/DDD. The 7-digit format displays the four-digit year and the number of days counting from January 1. For example, January 3, 2001 in Julian format is 2001003.

FORMAT=JUL is still supported; however, only the last two digits of the year display (YY/DDD).

### Example Displaying a Date in YYJUL Format

The example displays expiration dates in YYJUL format. It also illustrates the definition of a new date field that converts the Julian date and displays it in YYMD format.

```
FILENAME=EXAMPLE, SUFFIX=FOC
SEGNAME=ROOT, SEGTYPE=S1
FIELDNAME=DRIVER_ID, ALIAS=, FORMAT=A9, $
FIELDNAME=EXP_DATE, ALIAS=, FORMAT=YYJUL, $
FIELDNAME=CLASS, ALIAS=, FORMAT=A2, $
DEFINE FILE EXAMPLE
 NEWDATE/YYMD=EXP_DATE;
 END
TABLE FILE EXAMPLE
 PRINT EXP_DATE NEWDATE CLASS
 BY DRIVER_ID
END
```

| DRIVER_ID | EXP_DATE | NEWDATE    | CLASS |
|-----------|----------|------------|-------|
| -----     | -----    | -----      | ----- |
| 123254365 | 2000/139 | 2000/05/18 | A4    |
| 254069503 | 1999/068 | 1999/03/09 | R4    |
| 675678904 | 2003/253 | 2003/09/10 | W9    |

## NF711: Altering Your System Date for Testing Purposes

TESTDATE is a new SET command that allows you to temporarily alter your FOCUS system date for a given application program. This allows you to determine what impact the year 2000 will have on your application programs.

**Note: Only use TESTDATE for testing purposes with a test database.**

The syntax for TESTDATE is:

```
SET TESTDATE = {yyyymmdd|TODAY}
```

where

*yyyymmdd*

Is an 8-digit date in the format YYYYMMDD.

TODAY

Is today's date. TODAY is the default.

The value of TESTDATE affects all reserved variables that retrieve the current date from the system. Setting TESTDATE also affects anywhere in FOCUS that a date is used (such as CREATE, MODIFY, MAINTAIN) but does not affect the date referenced directly from the system.

TESTDATE can either be equal to TODAY or a date in the format YYYYMMDD. If anything else is entered the following message is displayed:

```
TESTDATE MUST BE YYYYMMDD OR TODAY
```

## NF713: MSO Log Changes

The MSO logs now display dates with four-digit years.

### Example Sample MSO Log

Following is a portion of a sample MSOPRINT log. Note that the dates display with four-digit years:

```
06/10/1998 12.12.13 [MSO13137] PROCESSING EDACFG CONFIGURATION FILE
06/10/1998 12.12.13 [MSO13137] PROCESSING FOOMSD CONFIGURATION FILE
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...1 *-----
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...2 * Sample MSD configuration file.
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...3 *
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...4 * This file is allocated to ddname FOOMSD
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...5 *
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...6 * The records and options which may be sp
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...7 * documented in the MSD Installation and
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...8 *
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...9 * Not all options which may be specified
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...10 * file; the options and values listed are
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...11 * be tailored to meet your installation's
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...12 *
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...13 * Please note that some of the options wh
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...14 * sample require APF authorization and/or
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...15 * steps; please check the manual for furt
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...16 *
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...17 *-----
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...18 *
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...19 *-----
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...20 * Global processing and options:
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...21 *-----
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...22 *
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...23 * Enable use of an external security packa
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...24 * EXTSEC = NO
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...25 * EXTSEC = YES
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...26 *
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...27 *-----
06/10/1998 12.12.14 [MSO13136] CONFIG LINE ...28 * Back to collection of processing statisti
```

## NF714: LE Support

You can now control use of IBM's Dynamic Language Environment for IBI-supplied and user-written subroutines by setting an option in FOCPARM, in a FOCUS application, or in your FOCUS session.

### Syntax How to Control the LE Environment Setting

The syntax for specifying the type of LE support you need is

```
SET IBMLE = {OFF|ON|ALL}
```

where:

**OFF**

Does not initialize the LE environment. OFF is the default value and is the recommended setting for applications using only IBI-supplied subroutines.

**ON**

Establishes the LE pre-initialization environment with the IBM default configuration. This configuration initializes the LE environment for subroutines coded in COBOL, PL/I, C, and ASMH if the routines are linked with the LE environment. If the application calls a module not supported under LE, it runs without LE. For a list of languages supported under LE, see [LE Language Support for User-Written Subroutines](#).

ON is the recommended setting for applications that call user-written subroutines linked with the LE environment and not coded in FORTRAN. ON is also recommended for applications that call a combination of these subroutines and IBI-supplied subroutines. Running IBI-supplied subroutines with this setting requires LE version 1.5 or above.

### ALL

Should be used only for user-created FORTRAN subroutines that need the LE environment. **Note:** This is not supported by IBM. The ALL setting adds FORTRAN to the list of languages supported for LE pre-initialization. The FORTRAN run-time libraries must be installed under LE. However, FORTRAN modules do not run under LE. ALL is the recommended setting for applications that call user-written subroutines written in FORTRAN if the FORTRAN run-time libraries were installed under LE. This setting requires LE version 1.5 and above.

## Reference LE Language Support for User-Written Subroutines

FOCUS supports LE access to user-written subroutines coded in the following LE-supported languages:

- C/MVS™.
- COBOL for MVS & VM (Release 2).
- COBOL/370™ (Release 1).
- VS FORTRAN (Version 2).
- PL/I for MVS & VM.
- ASMH (with macro support).

## Recommended IBMLE Settings

LE pre-initialization may be beneficial for application performance when using 3GL user-written subroutines. However, users should be aware that IBM may modify the LE environment at any time; its use is the responsibility of the user based on system analysis and resource requirements. IBM provides extensive documentation regarding LE at the following URL: [www1.s390.ibm.com/os390](http://www1.s390.ibm.com/os390).

Use the guidelines in the following table to determine the appropriate setting for each FOCUS application. If you need to change the setting in a particular application or in a FOCUS session, issue the SET IBMLE command prior to executing the first subroutine call. Results can be unpredictable if you change the setting between FOCEXECs or subroutine calls.

| <b>The application calls ...</b>                                                        | <b>Setting</b> |
|-----------------------------------------------------------------------------------------|----------------|
| At least one FORTRAN module, and the FORTRAN runtime libraries were installed under LE. | ALL            |
| Modules linked with the LE environment and coded in languages other than FORTRAN.       | ON             |
| Only IBI-supplied subroutines and modules not linked with LE.                           | OFF            |

## **Determining Proper IBMLE Settings**

The following table describes the results of various IBMLE settings on supported LE subroutines:

| <b>Type of Subroutine</b> | <b>Required Setting</b> | <b>Effects of Changing the IBMLE Setting</b>                                        |
|---------------------------|-------------------------|-------------------------------------------------------------------------------------|
| IBI-supplied              | any setting             | None, works with any IBMLE setting.                                                 |
| FORTRAN/LE                | ALL                     | ALL is the only supported setting for FORTRAN/LE. Requires LE release 1.5 or above. |



| Type of Subroutine | Required Setting | Effects of Changing the IBMLE Setting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| COBOL/LE           | ON or ALL        | <p>For performance reasons, link-edit the subroutine as reusable (<code>reus</code>).</p> <p>If the subroutine must be executed with IBMLE=OFF, apply the COBOL run-time option <code>rtereus</code> to the routine.</p> <p>Without this option, the subroutine returns invalid data and generates the following messages:</p> <pre>IGZ0044S There was an attempt to call the COBOL main program [xxxxxxxx] that was not in initial state.  The traceback information could not be determined.</pre> <p>The job does not abend but produces a CEEDUMP prefaced by:</p> <pre>CEE3DMP[release]: Condition processing resulted in the unhandled condition.</pre> |
| PL/I - LE          | ON or ALL        | <p>If executed with IBMLE=OFF, results in an 0C1 abend.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

**Note:**

- Non-LE Assembler subroutines require source code changes in order to be LE compliant.

- Mixed-mode applications calling both LE and non-LE subroutines in the same FOCEXEC or FOCUS session are not supported and may produce unpredictable results.

## 7.0.8 New Features

### Year 2000

Project 2000 - Phase III

NF605: Date Handling for the Year 2000 in FOCUS

NF620: Year 2000 Subroutines

### Performance Enhancements

NF564: Pooled Tables

NF593: IUCV CMS SU

NF617: Automatic Allocation of FOCUS Files

### Raised Limits

NF642: Increased DEFINE Limitation

### Reporting Enhancements

NF579: Assigning Screening Conditions to a File for  
Reporting Purposes

NF586: Expanding Byte Precision for COUNT and LIST

NF623: Increasing the Number of Verbs in a Report  
Request

## **General Enhancements**

**NF607: TABLA Enhancements**

**NF609: Sink Validation of Userids in CMS**

**NF630: Querying Which PTFs Have Been Applied for a Specific Release**

**NF631: Extended Plists**

**NF640: Dynamic Language Environment (LE) Support**

## **The Multi-Session Option**

**NF566: MSO/CICS Cooperative Processing**

## **Web Interface for FOCUS**

**NF619: -HTMLFORM SAVE**

**NF626: JAVA Graph Wizard**

**NF594: JAVA Report Assist**

**NF628: Automatic Activation of Web Interface for Web Browser Users**

**NF645: WEBHOME**

## **Relational Interfaces**

**NF568: DB2 Interface IF-THEN-ELSE Optimization**

**NF571: DB2 Interface SET ISOLATION Command**

**Model 204 Interface**

**NF572: Invisible Ordered Character and Ordered  
Numeric Data Type Key Support**

**IMS Interface**

**NF550: EDA/MSO Console Display for IMS PSB**

**System 2000 Interface**

**NF574: System 2000 Interface Trace Facility**

**Teradata Interface**

**NF583: Teradata Outer Join Optimization**

**National Language Support**

**NF647: Extended Support for Scandinavian External Sort**

## NF550: EDA/MSO Console Display for IMS PSB

The EDA/MSO Console for the DU (Display Users) screen includes a new column heading named **PSB**. This column displays the name of the IMS PSB scheduled for each TCB that is accessing IMS. IMS PSB names are up to 8 characters in length.

### Usage

When an EDA/MSO user subtask is accessing IMS, a PSB is used. By selecting DU from the Console and scrolling the display to the third screen to the right, a column named PSB will display the IMS PSB scheduled by a TCB. This is especially useful when a user subtask is not responding due to a runaway query. If the operator decides to, he can cancel that particular subtask.

In the case where an IMS error condition is encountered, the PSB column remains populated; however, an asterisk (\*) is placed in the first position as an indicator of an error condition. This can be useful for debugging purposes and/or notification of other users attempting to use that particular PSB.

### Example Sample Console DU Screen

Below is an example of the CONSOLE DU screen display:

```
<PMSLCCM JOB04558----- .CONSOLE DISPLAY USERS PANEL. -----
Line:001(002) Col:153
COMMAND ==>

C Logon_ID Runcount MVSDD USER-DD OPN DDs QueryID1 QueryID2 PSB
REGION
USER01 ALLPSB
```

In the above example, userid USER01 has scheduled a PSB named ALLPSB. If an error was encountered, the PSB display for the user would have read:  
**\*LLPSB.**

## **Reference Special Considerations**

The PSB name will be populated at the time that the PSB is scheduled by the user subtask, and is removed after the DBCTL thread connection is successfully de-allocated. If an IMS error is encountered, the PSB column will remain populated until another PSB is scheduled. The PSB column is cleared whenever an END THREAD command is processed, or an OPEN thread is attempted. This feature requires no action to be activated.

## **Error Messages**

None.

## NF564: Pooled Tables

Pooled Tables is a FOCUS performance feature for reporting applications that enables many reports or extract files to be created from a single pass of a database. Requests from any database, file, or JOINed structure that FOCUS reads can be pooled, reducing all of the normal reporting costs including database I/O, CPU and elapsed time. Performance gains with Pooled Tables can be dramatic; there is no penalty for its use -- even with applications that do not take advantage of it.

Pooled Tables is simple to use: by just adding a few lines to your application, Pooled Tables does the work of identifying reports that can share database I/O and running them concurrently.

Pooled Tables is ideal for large applications with many reports and batch reporting applications. Additionally, reports where data retrieval costs are significant compared to formatting costs benefit greatly from Pooled Tables.

There are several additional efficiencies that users can employ to maximize performance gains achievable through Pooled Tables.

This document describes how to use Pooled Tables. Refer to the *Pooled Tables White Paper* (DN1100978.0498) for additional information describing the internal logic.

This document covers the following topics:

- Overview - a general overview of Pooled Tables.
- Memory Needs - covers memory requirements for Pooled Tables.
- Report Size Estimates - describes record and line estimates for Pooled Tables.



- FOCPOOLT - describes a temporary work file Pooled Tables sometimes creates.
- Reporting Statistics - describes changes to the ? STAT output.
- Sort Selection - describes criteria for sort selection.
- Managing Memory - describes how you can control memory usage.
- Common Selection Criteria - describes efficiencies developers can employ.
- Reporting from Non-Relational databases - provides general information for using Pooled Tables with Non-Relational databases.
- Reporting from Relational databases - provides general information for using Pooled Tables with Relational databases.
- Trace Facility - describes the Pooled Tables trace facility.
- Pooled Tables in Batch Mode - provides general information for using Pooled Tables in batch mode.
- Tuning applications - provides suggestions for using Pooled Tables more efficiently.
- Syntax - provides syntax reference.
- Pooled Tables Example - illustrates the use of Pooled Tables commands.
- Single TABLE Clusters - describes situations when pooling is not done.
- Subpool Boundary Conditions - describes situations that constitute boundaries.
- Pooled Tables Installation Instructions
- Usage Notes
- Frequently Asked Questions
- Error Processing

### Overview

Pooled Tables should be used whenever two or more consecutive reports are executed against the same database. It is ideal for use with large batch or canned FOCUS reporting runs and data-extract applications. The feature is implemented with only a few simple SET commands. There is no need to change an application. A sample program that uses Pooled Tables is illustrated in the section [Pooled Tables Example](#).

A pool begins with the command `SET POOL=ON` and continues until `SET POOL=OFF` is encountered. Within a pool, FOCUS reads ahead in an application searching for consecutive TABLE requests that access the same file using the same access method. This read ahead feature extends across FOCEXECs and divides commands into retrieval and non-retrieval categories called subpools. A subpool is a collection of TABLE requests and related commands. Only report requests within a subpool can be combined.

Commands that alter data or the processing environment create subpool boundaries. For example, in the sequence

```
TABLE FILE CAR
... END
TABLE FILE CAR
... END
MAINTAIN FILE CAR
... END
TABLE FILE CAR
... END
```

a subpool boundary occurs at the MAINTAIN command. A list of subpool boundary commands appears in the section [Subpool Boundary Conditions](#).

Subpools are further divided into clusters. A cluster is a set of consecutive TABLE requests that share the same logical database and access method. For example, two TABLE requests against a VSAM file, one using sequential access and the other using indexed retrieval, are placed in separate clusters because of the different access methods. Reports that cannot be pooled because of syntax or environmental conditions are executed as single TABLE clusters. A list of these conditions appears in [Single TABLE Clusters](#).

All TABLE requests in a single cluster are executed concurrently and share the same data retrieval and screening processes. Sorting and output formatting are not shared.

The figure below diagrams the breakdown of pools into sub-pools and clusters:

```

SET POOL=ON

TABLE FILE EMPLOYEE
END
TABLE FILE EMPLOYEE
END
TABLE FILE EMPLOYEE
END

TABLE FILE CAR
END
TABLE FILE CAR
END
-RUN

TABLE FILE CAR
END
-RUN

TABLE FILE EMPLOYEE
END
TABLE FILE EMPLOYEE
END

SET POOL=OFF

```

Diagram illustrating the pooling of tables:

- The first three `TABLE FILE EMPLOYEE` statements are grouped by a bracket labeled **CLUSTER**.
- The next three `TABLE FILE CAR` statements (including `-RUN`) are grouped by a bracket labeled **CLUSTER**.
- The final two `TABLE FILE EMPLOYEE` statements are grouped by a bracket labeled **CLUSTER**.
- The first two clusters are grouped by a bracket labeled **SUBPOOL**.
- The third cluster is grouped by a bracket labeled **SUBPOOL**.
- The two subpools are grouped by a bracket labeled **POOL**.

## Memory Needs

The number of reports that can be executed in a single cluster is limited only by the amount of memory the user allocates to Pooled Tables (POOLMEMORY). More reports can be run concurrently with Pooled Tables when larger amounts of memory are available. Memory requirements for each report depend on the number of records included in the report, the number of lines of output, and the width of the report. Pooled Tables calculates these memory requirements. In general, the memory needed for small summary reports can be estimated as `NUMBER OF LINES OF OUTPUT * REPORT WIDTH`. The memory needed for large summary reports and detail reports can be estimated as `NUMBER OF RECORDS SELECTED * REPORT WIDTH`. The Pooled Tables trace facility displays the actual amount of memory allocated for each report and the statistics used to calculate it.

**When available memory is insufficient for simultaneously executing all of the requests in a cluster, Pooled Tables executes them in a series of steps, called iterations.**

When multiple iterations are required, Pooled Tables produces as many reports as it can directly in memory during the first iteration. Concurrently, data for the remaining reports in the cluster are staged in a work file called FOCPOOLT. The rest of the reports are then produced from the data in FOCPOOLT in subsequent iterations. The source database is only accessed once at the beginning of the process.

## **Report Size Estimates**

To calculate memory needs, Pooled Tables requires accurate estimates of the size of each report to deliver optimal performance. These estimates are used to select the appropriate sort and distribute memory resources equitably across the several reports in the pool. Input report size equals the number of records in the report following selection (ESTRECORDS); output report size is the number of output lines after aggregation is complete (ESTLINES). These estimates apply to the individual reports, not the size of the set of reports in the cluster.

ESTLINES and ESTRECORDS estimates can be gathered from:

- The statistical message: NUMBER OF RECORDS IN TABLE= LINES=
- The RECORDS and LINES information available on the ? STAT output.
- Previously gathered information from the &RECORDS and &LINES variables.
- When ACROSS is used, ESTLINES = number of lines X number of unique ACROSS columns.
- When IF TOTAL or WHERE TOTAL is used, ESTLINES is the number of lines before the TOTAL selection is made.

These estimates should be set individually for every request. Global settings can be issued, however. If ESTRECORDS is set for a group of requests, the estimate should be representative of the most common reports and need not exceed the size of the database.

## **FOCPOOLT**

The temporary work file FOCPOOLT is created only when a cluster contains more reports than can be executed in available memory (POOLMEMORY). If a cluster can be produced directly from memory, the FOCPOOLT file is not created.

For example, a cluster has 30 reports, each of which requires 1 megabyte of memory. There are 10 megabytes of memory available (POOLMEMORY). Pooled Tables retrieves all of the data once and produces the first 10 reports from memory (this is the first iteration). The records for the remaining 20 reports are written to the work file FOCPOOLT. In the second iteration, Pooled Tables reads data for the next 10 reports from FOCPOOLT and produces them. The final 10 reports are produced in the third iteration.

It is more efficient to get data from FOCPOOLT than the database, because data in FOCPOOLT has already been screened and formatted. In addition, Pooled Tables determines accurate record counts (ESTRECORDS) for all reports in the second and subsequent iterations. Memory needs for these reports are more accurately calculated, further optimizing Pooled Tables performance.

The size of FOCPOOLT depends on the volume of data in the reports that are executed in the second and subsequent iterations. Data required only for reports in the first iteration are not stored in FOCPOOLT. Overlapping data required for more than one report is stored only once. The size of FOCPOOLT will never exceed the size of the logical database used for the cluster. Typical size requirements for FOCPOOLT are the same as those for the largest FOCSORT file for any report in the pool.

For MVS users, the default allocation for FOCPOOLT is 5 primary and 20 secondary cylinders. FOCUS uses a second volume if all extents on the first volume are used. It is recommended that the user pre-allocate FOCPOOLT with the necessary space attributes under MVS. DCB information will be determined by FOCUS.

In CMS, adequate temp disk space must be made available for this file.

## **Reporting statistics**

? STAT has been enhanced to display pooling statistics for each pooled report. It can be used to identify pooling characteristics in an application and tune the application.

Below is an annotated sample of the output for ? STAT with only the information for Pooled Tables shown.



| STATISTICS OF LAST COMMAND |   |        |   |                 |   |       |  |     |  |
|----------------------------|---|--------|---|-----------------|---|-------|--|-----|--|
| RECORDS                    | = | 50000  | . |                 |   |       |  |     |  |
| LINES                      | = | 50000  | . |                 |   |       |  |     |  |
| .                          |   |        | . |                 |   |       |  |     |  |
| .                          |   |        | . |                 |   |       |  |     |  |
| .                          |   |        | . |                 |   |       |  |     |  |
| 1. READS                   | = | 250000 | . |                 |   |       |  |     |  |
| .                          |   |        | . |                 |   |       |  |     |  |
| .                          |   |        | . |                 |   |       |  |     |  |
| .                          |   |        | . |                 |   |       |  |     |  |
| .                          |   |        | . |                 |   |       |  |     |  |
| 2. SUBPOOL                 | = | 1      |   |                 |   |       |  |     |  |
| 3. CLUSTER                 | = | 2      |   | ITERATION       | = | 1     |  | 8.  |  |
| 4. #CLUSTER ITEMS          | = | 25     |   | #ITER ITEMS     | = | 16    |  | 9.  |  |
| 5. SEQ# IN CLUSTER         | = | 5      |   | SEQ# IN ITER    | = | 5     |  | 10. |  |
| 6. ESTIMATED RECS          | = | 50000  |   | ESTIMATED LINES | = | 50000 |  | 11. |  |
| 7. REPORT WIDTH            | = | 148    |   |                 |   |       |  |     |  |

Where, for the report just run:

1. **READS** The total number of records retrieved for the cluster.
2. **SUBPOOL** The report is in the first subpool.
3. **CLUSTER** The report is in the second cluster.

- |                      |                                                                                                                                                                                   |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.   # CLUSTER ITEMS | There are 25 reports in the cluster.                                                                                                                                              |
| 5.   SEQ# IN CLUSTER | This is the fifth report in the cluster.                                                                                                                                          |
| 6.   ESTIMATED RECS  | ESTRECORDS has been set to 50,000. This number should be compared with RECORDS at the top of this ? STAT. If there is a discrepancy, change the ESTRECORDS value for this report. |
| 7.   REPORT WIDTH    | The report width is 148 bytes.                                                                                                                                                    |
| 8.   ITERATION       | This report was produced in the first iteration.                                                                                                                                  |
| 9.   # ITER ITEMS    | There are 16 reports produced in the first iteration. The next 9 reports are executed during subsequent iterations.                                                               |
| 10   SEQ# IN ITER    | This is the fifth report in this iteration.                                                                                                                                       |
| .                    |                                                                                                                                                                                   |
| 11   ESTIMATED LINES | ESTLINES has been set to 50,000. This number should be compared with LINES at the top of this ? STAT. If there is a discrepancy, change the ESTLINES value for this report.       |
| .                    |                                                                                                                                                                                   |

## **Sort Selection**

Pooled Tables uses the report size estimates to choose the appropriate sort: an in-memory FOCUS sort or an external sort. The FOCUS sort is used for all reports whose memory needs are less than 1 megabyte. In general, an external sort is used for all other cases. The maximum number of concurrently executing sorts, and thus the maximum number of concurrently executing reports, is limited by the amount of memory available to Pooled Tables. The maximum number of external sorts that can be used by Pooled Tables is 26. This number can be decreased with the MAXEXTSRSTS setting. The number of external sorts can also be limited by the amount of available memory below the 16 megabyte line in MVS. In VM, only one version of the external sort can be executed when the sort package is SyncSort. When practical, the FOCUS sort is substituted for the external sort when the number of external sorts is limited but memory is available.

## **Managing Memory**

The maximum amount of memory used by Pooled Tables can be limited with the POOLMEMORY setting. In MVS, the number represents memory above the 16 megabyte line. In VM, the number represents total virtual memory. The default value for POOLMEMORY is 16,384 K (16 M). The minimum value is 1,024 K. A maximum bound can be placed on POOLMEMORY when Pooled Table is installed. In MVS, you can also control the total amount of memory available from the operating system above the 16 megabyte line by coding REGION=nM in your JCL job card , where n is greater than 16. POOLMEMORY can be set from the command line, during FOCUS initialization (in the PROFILE FOCEXEC), or within an application.

Memory is reserved by using the POOLRESERVE setting. This reserves a portion of available memory for system or FOCUS use that is not to be used by Pooled Tables. In MVS, the default is 100K. In VM the default is 1,024 K. The default value can be changed at installation time. POOLRESERVE can be set from the command line, during FOCUS initialization (in the PROFILE FOCEXEC), or within an application.

The purpose of POOLRESERVE is to reserve memory during Pooled Tables' parsing and decision making process for other modules. For example, first time access to SQL/DS requires loading of IBI interface code and IBM modules. The memory needed for these is not used in the Pooled Tables case until the common read is executed. After these modules are loaded, POOLRESERVE can be reduced, possibly to zero. If the IBI interface and IBM load modules are stored in a saved segment, POOLRESERVE can be reduced prior to execution of Pooled Tables.

Suggested values for POOLRESERVE are :

|                                              |        |
|----------------------------------------------|--------|
| Running an interface (not in saved segment): | 1024 K |
| Running an interface (in saved segment):     | 256 K  |
| Using SyncSort as the external sort:         | 512 K  |
| Using any other sort:                        | 128 K  |

## Common Selection Criteria

Common selection statements that appear in every report in the cluster are applied during Pooled Tables retrieval. The common test must refer to the same field and use an equality screening relational operator (`EQ` or `IS`). The selected values do not need to be the same in all reports. For example, if the first report has the test `WHERE FISCAL_YEAR EQ 1997` and the second request has the test `WHERE FISCAL_YEAR EQ 1998`, the test `WHERE FISCAL_YEAR EQ 1997 OR 1998` is evaluated during Pooled Tables retrieval. Common selection tests are included to reduce the size of the answer set returned for a pool.

Common selection criteria that do not use equality can be evaluated by Pooled Tables using another FOCUS feature: Filters. Filters allow you to specify simple or complex selection tests for all reports against the same file. Filters in effect for all reports in a cluster are also applied during Pooled Tables retrieval. The use of Filters allows you to reduce the size of the pooled answer set, even when there are no common equality selection tests.

## Reporting from non-Relational Databases

Reports against non-relational databases, such as VSAM, IMS, IDMS, FOCUS, and sequential files, must meet several simple criteria in order to be pooled together into one cluster. First, all reports must access the same database, using the same Master File Description. Next, the reports in a cluster must share the same access method. For example, reports that use sequential access can be pooled together; reports that use indexed access can be pooled together. Finally, all reports in a cluster must share the same entry point. That is, the reporting view must be from the same segment and, in the case of indexed access, from the same field. Reports against sequential files always meet these criteria so they always pool. Reports against JOINed structures are pooled together based on the access method to the host file.

## Reporting from Relational Databases

Reports against relational databases, such as DB2 and SQL/DS, can be pooled into the same cluster when they share several common attributes. Like non-relational files, all reports must access the same Master File Description from the same entry point. Reports that require SQL aggregation (that is, the generated SQL statements contain the `GROUP BY` phrase) are not pooled. This assures that the set presented to each report in the pool is accurate.

Further, all requests against a multi-table relational view must reference the same tables to be pooled into the same cluster. Consider, for example, a view that contains table 'A' and table 'B'. All reports that reference only fields from table 'A' can be pooled together; all reports that reference only fields from table 'B' can be pooled together, and all reports that reference fields from both tables 'A' and 'B' can be pooled together. However, none of the reports in each of these three preceding sets can be pooled with reports from another set. This limitation is imposed to assure that the same optimization logic is used by the RDBMS retrieval engine for each report in the set.

Pooling requirements for relational databases are less stringent when optimization is turned off (`SQL SET OPTIMIZATION OFF`). In this case, FOCUS manages the retrieval and aggregation. Therefore, pooling conditions are the same with optimization off as for non-relational databases. Restrictions regarding common accessed tables and SQL aggregation do not apply. The benefits of pooling reports with optimization off versus allowing the RDBMS to optimize retrieval vary from case to case. For example, a request that requires an area sweep and returns a large answer set, even with optimization, would be a good candidate to pool with other requests by turning optimization off.

When using the interface trace facility for a relational database, the generated SQL for each request is echoed. The SQL is generated during the Pooled Tables parsing phase but is not submitted to the RDBMS. Instead, Pooled Tables constructs an internal request to retrieve all of the data required for the cluster. The SQL SELECT statements generated for the cluster are echoed in the trace. These are the statements that are passed to the RDBMS.

The SQL SELECT statements generated by Pooled Tables are the ones optimized by the RDBMS. Therefore, the best optimization occurs when all requests in a cluster contain the same equality screening conditions or Filters (see [Common Selection Criteria](#)). In these cases, the screening tests are included in the SQL and passed to the RDBMS for optimization. Without common selections or Filters, it is possible that efficiencies gained from RDBMS optimization may be lost when pooling individual requests. For example, consider two requests: the first request returns a small answer set based on a selection against a key field named KEY1. The second request returns a small answer set based on a selection against a different key field named KEY2. The independent screening conditions are not included in the SQL generated by Pooled Tables, resulting in an area sweep and large answer set for the cluster. If the two tests are included as an OR condition in a Filter, the screening tests will be passed to the RDBMS. A much smaller answer set will be returned to Pooled Tables.

### **Pooled Tables in Batch Mode**

Pooled Tables can automatically pool all batch requests. For batch jobs to become pools, issue the SET command POOLBATCH, from either users PROFILE or in FOCPARM. Wherever possible, pooling automatically occurs. In the context of Pooled Tables, 'batch' means any non-interactive FOCUS session. In MVS, this occurs in batch jobs, or when ddname SYSIN is allocated to a dataset. In VM, a non-interactive job occurs when ddname SYSIN is FILEDEFed to a file, FOCUS is invoked with the syntax `FOCUS IN fileid`, or the VM session is running disconnected.



## Trace Facility

In general, the trace facility displays the reasons for segregation of a pool into subpools and clusters, warnings when allocating insufficient memory, and completion statistics for pooled reports. The purpose of the trace facility is to assist the application developer in determining how a pool was executed so that the information can be used in tuning the application.

The trace facility is started by issuing the command `SET TRACEON=POOLTABL`. By default, the trace output is routed to the ddname PTTRACE which is allocated to SYSOUT (MVS) or the terminal (VM). You can select a different ddname by issuing the command `SET TRACEON=POOLTABL//ddname`. To route the output to disk, allocate or FILEDEF ddname PTTRACE (or the optional ddname you selected) to a file with LRECL 160 and disposition MOD. You may also allocate the ddname to the terminal. Stop the trace by issuing the command `SET TRACEOFF=POOLTABL`.

The following messages are displayed when a subpool boundary is encountered:

```
Subpool boundary--prior output required as input
Subpool boundary--FOCUS/SET command
Subpool boundary--DEFINE ADD
Subpool boundary--new MASTER name
Subpool boundary--new DEFINE clears pre-pool DEFINE
This command will run now, outside of pooling:
A DEFINE ADD will run now, outside of pooling.
```

The following messages are displayed when a cluster boundary is encountered:

```
Cluster boundary--new master name
Cluster boundary--single-table cluster
Cluster boundary--new alternate view
Cluster boundary--new pool flag
Cluster boundary--new pool condition
Cluster boundary--mid-stream DEFINE
Cluster boundary--new entry segment
Cluster boundary--too many verb objects
```

The following messages are displayed for reports that cannot be pooled (they are single-table clusters):

```
Single-table cluster--REDEFINED real field
Single-table cluster--User subroutine not known safe
Single-table cluster--self-referential DBA/filter
Single-table cluster--INCLUDES/EXCLUDES selection
Single-table cluster--too many test literals
Single-table cluster--complex test on index
Single-table cluster--$ORTPARM allocated
Single-table cluster--REDEFINED constant real field
Single-table cluster--RANKED BY
Single-table cluster--COUNT DISTINCT
Single-table cluster--RECAP
Single-table cluster--COUNT is a verb object
Single-table cluster--indexed view via AUTOINDEX
Single-table cluster--EMR
Single-table cluster--ON TABLE SET
Single-table cluster--TEXT field
Single-table cluster--PREVIEW mode
Single-table cluster--ALL = ON/PASS
Single-table cluster--per message above
Single-table cluster--indexed view for FOCUS database
Single-table cluster--non-poolable interface request
Single-table cluster--too many verb objects
```

The following messages appear in the trace during the creation and execution of clusters and iterations:

```
Building cluster x...
Cluster contains n table(s)
Cluster n dedicated to command x
Clusters built; subpool contains x cluster(s).
***** Stack before 1st cluster: *****
***** Stack before nth cluster: *****
***** Begin union table *****
**** Stack before nth iteration: ****
```

During the parsing phase of the Pooled Table process, the following statistics are displayed for each report. They are used to determine if a report is poolable and under what conditions. All reports that have the same pooling criteria can be pooled with each other.

```
Entry Segment : x
Relational Flag : y
Pool Flag : z
Condition Length: n
Condition : c
```

After a pooled report is executed, the output from ? STAT is included in the trace. The entries for TRACKIO and MINIO are included in the output but their values are not populated. In addition, the following statistics are included:

```
TRAVERSAL MTHD = x ENTRY SEGMENT = i
FOCUS SORT MEM = y1 EXTSORT MEMORY = y2
ALGORITHM USED = z
```

The following messages are displayed to indicate limitations imposed on Pooled Tables to execute reports under the most favorable conditions, based on parameters provided by the user (POOLMEMORY, POOLRESERVE, ESTRECORDS, and ESTLINES) or the available memory. These messages will not inhibit the execution of Pooled Tables. To correct these situations, replace the values for ESTRECORDS and ESTLINES with accurate values or make more memory available for Pooled Tables.

```
concurrent external sorts reduced from x to y by below-16M shortage
Minimum sort memory forces iterations
Warning--POOLMEMORY desired = x but only y is available
Warning: actual line count (x) exceeds lines estimate (y) in heavy
aggregation case
Warning: records estimate (x) off by more than 10%-actual record count=y
Warning: lines estimate (x) off by more than 10%-actual line count = y
```

## Tuning Applications

Pooled Tables will always pool any application when POOL is set ON. Pooled Tables works best when accurate estimates for ESTRECORDS, ESTLINES, and POOLMEMORY are given for each request. These numbers can be determined by reviewing the statistics from previous runs. If these estimates are not provided, FOCUS uses the defaults: ESTRECORDS=100000, ESTLINES=0, and POOLMEMORY=16,384K. When ESTLINES is 0, Pooled Tables uses the current value of ESTRECORDS for ESTLINES. While these defaults are adequate for large extract reports, they may provide minimal benefit if they are grossly inaccurate.

To optimize pooling capacity, provide ample memory to Pooled Tables. Increase POOLMEMORY to an adequate size. Provide a sufficient region size (MVS) or virtual memory (VM). Reduce POOLRESERVE once interface and other modules are loaded. Furnish accurate estimates for ESTRECORDS and ESTLINES.

To optimize pooling capability, remove all unnecessary subpool boundary commands such as extraneous -RUNs. Consolidate the necessary boundary commands such as the DYNAMs, SETs, etc. Organize the requests for optimal cluster usage by putting all requests for the same database with the same entry point and retrieval method together. This will increase the opportunity for pooling more requests in one cluster.

To optimize retrieval and reduce the size of the answer set returned by Pooled Tables, use Filters to screen data. For example, if all reports in a cluster use `WHERE DELETE_FLAG NE 'Y'`, create a filter with this test. Alternately, change the test to read `WHERE DELETE_FLAG EQ 'N'` so that the common selection statement is used in the Pooled Tables common read.

### Syntax    How to Use Pooled Tables

To activate Pooled Tables, issue the following command

```
SET POOL = {OFF|ON}
```

where:

OFF

Ends Pooled Tables and executes any queued requests.

ON

Begins Pooled Tables.

Issue the following command in a report request to supply an estimate for the number of input records for that report:

```
ON TABLE SET ESTRECORDS m
```

where:

*m*

Is the estimate of the number of records being retrieved for a report.

You can assign a global value for each report in a pool with the following command

```
SET ESTRECORDS=m
```

The default value is 100,000.

Issue the following command in a report request to supply an estimate for the number of output lines for that report:

```
ON TABLE SET ESTLINES n
```

where:

*n*

Is the user's estimate of the number lines of output for a report.

You can assign a global value for each report in a pool with the following command

```
SET ESTLINES=n
```

The default value is 0. If no value is given, Pooled Tables assumes there is no aggregation and the number of lines is the same as the number of records.

To set a limit on the amount of memory that FOCUS can use for pooling a cluster for a user, issue the following command

```
SET POOLMEMORY=n
```

where:

*n*

Is the upper limit on the number of kilobytes of memory that FOCUS may use during any cluster for this user. In MVS, the number represents memory above the 16 megabyte line. In VM, the number represents total virtual memory.

The default value is 16,384 K (16 M). The minimum value is 1,024 K.

To reserve memory for other modules, issue the following command

```
SET POOLRESERVE =n
```

where:

*n*

Is the amount of memory in kilobytes to reserve for other modules and restrict Pooled Tables from using.

In VM, the default is 1,024K. In MVS, the default is 100K.

To set a limit on the number of concurrent external sorts that can run, issue the following command

```
SET MAXEXTSRTS=n
```

where:

*n*

Is the number of concurrent external sorts that can run.

Is a number from 1 to 26. The default is 26. In VM, only one version of SyncSort can run concurrently. If you use SyncSort in VM, the value of MAXEXTSRTS is assumed to be 1.

To control whether Pooled Tables is used automatically for batch processing, issue the following command

```
SET POOLBATCH = {OFF|ON}
```

where:

**OFF**

Does not enable automatic use of Pooled Tables for batch processing. This is the default.

POOLBATCH can be included in the FOCPARM ERRORS, FOCUS PROFILE, a FOCEXEC, or issued in the SYSIN input stream.

**SET POOLBATCH=ON** has the effect of automatically setting **POOL=ON** for batch execution. **SET POOLBATCH=OFF** will not reverse this setting. To disable pooling when **POOLBATCH=ON**, issue the command **SET POOL=OFF**.

**ON**

Enables automatic use of Pooled Tables for batch processing.

To identify an external sort utility to use for Pooled Tables, issue the following command

```
SET SORTLIB = sorttype
```



where:

*sorttype*

Can be one of the following

|                 |                                                                                             |
|-----------------|---------------------------------------------------------------------------------------------|
| <i>SYNCSORT</i> | Identifies the external sort utility as SYNCSORT.                                           |
| <i>DFSORT</i>   | Identifies the external sort utility as DFSORT.                                             |
| <i>VMSORT</i>   | Identifies the external sort utility as VMSORT.                                             |
| <i>MVMSGSS</i>  | Identifies the external sort utility as SYNCSORT and its messages are displayed (MVS only). |
| <i>MVMSGDF</i>  | Identifies the external sort utility as DFSORT and its messages are displayed (MVS only).   |

To direct the trace output, issue the following command

```
SET TRACEON=POOLTABL // {PTTRACE|ddname}
```

where:

*PTTRACE*

Is the default ddname where the trace output is directed.

*ddname*

Is an optional ddname where the trace output can be directed.

To turn off the trace facility, issue the following command

```
SET TRACEOFF=POOLTABL
```

where:

*POOLTABL*

Ends the Pooled Tables Trace facility.

## Pooled Tables Example

The following example illustrates the ease in which Pooled Tables can be implemented. In it, a small amount of memory is made available for Pooled Tables (4,000K), pooling is turned on, and report size estimates are provided for each report. The reports will be queued until pooling is turned off. At that time, data will be retrieved only once for all of the reports in the pool. The reports will be executed concurrently and the output printed one after the other.

```
SET POOLMEMORY = 4000
SET POOL = ON
TABLE FILE EMPLOYEE
PRINT LN FN BY DPT IF HIRE_DATE GE 860101
ON TABLE SET ESTLINES 1000 AND ESTRECORDS 1000
END
TABLE FILE EMPLOYEE
SUM CURR_SAL BY CURR_JOBCODE IF CURR_JOBCODE EQ 'A$*'
ON TABLE SET ESTLINES 5 AND ESTRECORDS 400
END
TABLE FILE EMPLOYEE
SUM GROSS BY PAY_DATE
IF PAY_DATE FROM 960101 TO 961231
ON TABLE SET ESTLINES 52 AND ESTRECORDS 1200
END
SET POOL = OFF
```

## Single TABLE Clusters

There are several instances when reports will not be pooled because of syntactical or environmental conditions. The reports will be executed as single TABLE clusters. Reports that fall into this category include:

- TABLEF requests.

- MATCH requests.
- Extended Matrix Reports (EMR).
- Reports using SET ALL=ON or PASS.
- Reports against FOCUS databases using an explicit indexed view or an implicit indexed view via AUTOINDEX.
- Reports against relational databases where aggregation is passed to the DBMS.
- Reports which use MORE, ON field RECAP, COUNT DISTINCT, DST., INCLUDES, EXCLUDES, or COUNT as a verb object.
- Reports that use a redefined database field.
- Reports issued from the FOCUS command line.
- Reports that use a self-referential Filter or DBA value restriction.
- Reports that have more than 256 values in an equality IF or WHERE test.
- Reports executed when \$ORTPARM is allocated.
- Reports that use a user written subroutine except those found in Table 1. In general, subroutines that require initialization and are then reused are not poolable. Random number generator subroutines are an example of these.

|        |        |        |        |        |
|--------|--------|--------|--------|--------|
| ARGLEN | ATODBL | AYM    | AYMD   | BAR    |
| BITSON | BITVAL | BYTVAL | CHGDAT | CHKFMT |
| CHKPCK | CTRAN  | CTRFLD | DADMY  | DADYM  |
| DAMDY  | DAMYD  | DAYDM  | DAYMD  | DMOD   |

|         |         |         |        |        |
|---------|---------|---------|--------|--------|
| DOWK    | DOWKL   | DTDY    | DTDYM  | DTMDY  |
| DTMYD   | DTYDM   | DTYMD   | EXP    | FEXERR |
| FINDMEM | FMOD    | FTOA    | GETPDS | GETTOK |
| GETUSER | GREGDT  | HEXBYT  | HHMMSS | IMOD   |
| ITONUM  | ITOPACK | ITDZ    | JULDAT | LCWORD |
| LJUST   | LOCASE  | OVRLAY  | PARAG  | PCKOUT |
| POSIT   | RJUST   | SOUNDEX | SUBSTR | TODAY  |
| UFMT    | UPCASE  | YM      |        |        |

**Table 1. Poolable User Written Subroutines**

## Subpool Boundary Conditions

A subpool is a collection of TABLE or GRAPH requests and their related commands. Subpool boundaries are imposed by non-retrieval commands. Only reports within a subpool can be pooled together to share the same I/O. Commands that cause subpool boundaries can change the data or retrieval method for the database. Therefore, reports on either side of a subpool boundary cannot be pooled together reliably. When a subpool boundary command is encountered, pooling is temporarily stopped and all queued requests are executed.

A subpool boundary is created when:

- A FOCEXEC completes execution and control is returned to the command line.

- A -RUN or -EXIT command is issued in a FOCEXEC.
- A `DEFINE FILE filename ADD` command is issued.
- Any non-TABLE or GRAPH command is issued that could change the data (MAINTAIN, MODIFY, SQL), change the source of the data (DYNAM, USE), change the retrieval method (JOIN, PASS, FILTER), or change the operating environment (TSO, MVS, CMS), Table 2 lists the retrieval commands that are part of a subpool. Table 3 lists the commands that cause subpool boundaries.
- Any SET or ON TABLE SET command that can alter retrieval or the Pooled Tables environment. Table 4 lists the SET commands that cause subpool boundaries. SET commands that appear in ? SET ALL and not on this list will not cause a subpool boundary. This list is accurate for FOCUS release 7.0.8 and is subject to change in subsequent releases.

**Table 2. Commands Included in a Subpool**

| ?      | ?F      | ?FF    | CHECK   | DEFINE |
|--------|---------|--------|---------|--------|
| GRAPH  | HELP    | HOLD   | OFFLINE | ONLINE |
| PCHOLD | REPLOTT | RETYPE | SAVB    | SAVE   |
| TABLE  | TABLEF  |        |         |        |

**Table 3. Commands That Cause Subpool Boundaries**

|          |            |          |          |           |
|----------|------------|----------|----------|-----------|
| ACE      | ANALYSE    | CALC     | CMS      | COMBINE   |
| COMPILE  | CREATE     | DECRYPT  | DYNAM    | ENCRYPT   |
| EX       | EXEC       | FILETALK | FILTER   | FIN       |
| FINISH   | FIXPACK    | FS       | FSCAN    | GRAPHTALK |
| JOIN     | LET        | LOAD     | MAINTAIN | MATCH     |
| MODIFY   | MODIFYTALK | MPAINT   | MVS      | PASS      |
| PLOTTALK | REBUILD    | RECALC   | REMOTE   | RESTRICT  |
| RUN      | SCAN       | SET      | SQL      | TABLETALK |
| TED      | TSO        | UNLOAD   | USE      | WINDOW    |
| XFER     |            |          |          |           |

**Table 4. SETs That Cause Subpool Boundaries**

|           |              |               |           |
|-----------|--------------|---------------|-----------|
| ADABAS    | AGGRRATIO    | ALL.          | AUTOINDEX |
| AUTOPATH  | AUTOSTRATEGY | AUTOTABLEF    | BINS      |
| BLKCALC   | BYPANEL 2    | BYSCROLL      | CACHE     |
| CALC      | CALCMEMORY   | CALCROWS      | CALCWAIT  |
| CARTESIAN | CDN          | COLUMNSCROLL2 | COMMIT    |
| COMPUTE   | CONSULTOPTN  | CURRENCY      | DATETIME  |

|             |             |               |              |
|-------------|-------------|---------------|--------------|
| DEFCENT     | ESTLINES 1  | ESTRECORDS 1  | EXTSORT      |
| FIELDNAME   | FILENAME    | FIXRETRIEVE   | FOCSTACK     |
| FOC144 1    | HIPERFOCUS  | HTMLMODE      | ICUFORM      |
| IMPLIEDLOAD | IMS         | LABELPROMPT   | LANGUAGE     |
| LE370       | LOADLIMIT   | LOOKGRAPH     | MAXLRECL     |
| MAXPOOLMEM  | MINIO       | MODE XXXXXX   | MPRINT       |
| PASS        | POOL        | POOLBATCH     | POOLFEATURE  |
| POOLMEMORY  | POOLRESERVE | PREFIX        | PREVIEW      |
| PRINTPLUS 2 | QUALCHAR    | RECORDLIMIT 1 | SAVEMATRIX 2 |
| SHIFT       | SM          | SQLENGINE     | SQLTCARTES   |
| SQLTOPTTF   | STYLEMODE   | SUSI          | SUTABSIZE    |
| TCPIPINT    | TEMP DISK   | TERMINAL      | TEXTFIELD    |
| TRACKIO     | TRMSD       | TRMSW         | TRMTYP       |
| USER        | WINPFKEY    | XRETRIEVAL    | YRTHRESH     |
| 3DGRAPH     |             |               |              |

1 - Subpool boundary with SET only

2 - Subpool boundary with ON TABLE SET only

## Pooled Tables Installation Instructions

This section describes installation instructions for all systems, IMS, MVS, and VM/CMS.

### Procedure Installation Instructions for All Systems

Pooled Tables is enabled for your release of FOCUS by including the command `SET POOLFEATURE = ON` in FOCPARM. To disable Pooled Tables, include the command

```
SET POOLFEATURE = OFF
```

in the FOCPARM file. If there is no `SET POOLFEATURE` in FOCPARM, FOCUS assumes Pooled Tables is disabled.

The maximum amount of memory above 16 megabytes that can be requested by a user with the `SET POOLMEMORY` command can be restricted by including the `SET MAXPOOLMEM = n` command in FOCPARM.

To make `POOL = ON` the default for all batch jobs, include the command `SET POOLBATCH = ON`. This must follow the `SET POOLFEATURE = ON` command in FOCPARM.

Each of the commands is also included in the member FOCPARM in ERRORS.DATA (MVS) or the file FOCPARM ERRORS (CMS).



## Procedure Installation Instructions for MVS

Include the POOLFEATURE, POOLBATCH, and MAXPOOLMEM commands in the member FOCPARM in ERRORS.DATA as outlined above. Refer to the MVS Installation Guide for FOCUS Release 7.0 (DN1000994.1097) or New Feature Memo 607, *TABLA Enhancements*, to change the default allocation for the file FOCPOOLT. If you use DFSort, refer to [Usage Notes](#) for information about a required IBM PTF.

## Procedure Installation Instructions for VM/CMS

Include the POOLFEATURE, POOLBATCH, and MAXPOOLMEM commands in the file FOCPARM ERRORS as outlined above. Change the value of POOLRESERVE in FOCPARM ERRORS if appropriate for your installation. See [Managing Memory](#) for recommended values.

## Commands for the FOCPARM file

To configure Pooled Tables, include the following commands in the FOCPARM file.

```
SET POOLFEATURE = {OFF|ON}
```

where:

[OFF](#)

Disables Pooled Tables for this FOCUS site.

[ON](#)

Enables Pooled Tables for this FOCUS site.

```
SET POOLBATCH = {OFF|ON}
```

where:

OFF

Does not enable automatic use of Pooled Tables for batch processing. This is the default.

POOLBATCH can be included in the FOCPARM ERRORS, FOCUS PROFILE, a FOCEXEC, or issued in the SYSIN input stream.

SET POOLBATCH=ON has the effect of automatically setting POOL=ON for batch execution. SET POOLBATCH=OFF will not reverse this setting. To disable pooling when POOLBATCH=ON, issue the command SET POOL=OFF.

ON

Enables automatic use of Pooled Tables for batch processing.

SET MAXPOOLMEM = *n*

where:

*n*

Sets upper limit in Kilobytes of memory above 16 megabytes available for users to set in the SET POOLMEMORY command. The default is 32,768 K (32 M). Minimum is 1,024K.

## Reference Usage Notes

- With pooling, there may be differences in the order of output records in unsorted reports (PRINT with no BYs).
- In MVS batch jobs that have set MSG=ON, the TABLE request appears twice in the output.
- ? SET ALL has been enhanced to display the values of Pooled Tables settings. No Pooled Tables settings have been added to ? SET.

- If it is needed, adequate temporary disk space must be made available for FOCPOOLT under CMS.
- If it is needed, it is recommended that the user pre-allocate FOCPOOLT with the necessary space attributes under MVS. DCB information will be determined by FOCUS.
- KX following the attention interrupt is not supported during a pooled request.
- Pooled Tables memory in MVS is generally restricted using the POOLMEMORY setting. Pooled Tables memory in VM is generally restricted by using the POOLRESERVE setting.
- An implied SET POOL=OFF is issued and all queued requests are executed when an explicit or implicit FIN command is encountered and POOL is still ON.
- When SyncSort is the external sort package, the ddname \$ORTPARM must not be allocated. If \$ORTPARM is allocated, pooling is disabled for **all** requests, not only those that require the external sort. A warning message is issued when pooling is attempted and \$ORTPARM is allocated.
- DFSort Release 13.0 has a limitation where only 10 sorts can be run concurrently in MVS. If you exceed this limit, DFSort will display the message:

`ICEL49A DFSORT IS NOT LICENSED FOR USE ON THIS SYSTEM.RETURN CODE 12,  
REASON CODE 4.`

This will cause FOCUS toabend. Issue the command SET MAXEXTSRSTS = 10 to temporarily avoid this symptom. This problem has been fixed by IBM with APAR OW29152. Order IBM PTF UW41671 if you are running SMS Release 1.3. Order IBM PTF UW41672 if you are running SMS Release 1.4.

## Frequently Asked Questions

- *"How can I control how much memory Pooled Tables uses? I am afraid that users will abuse memory resources."*

The command SET POOLMEMORY=n, where n is in kilobytes, sets the upper bound of memory that FOCUS will use for pooling on a per user basis. The default is 16 Megabytes and the minimum is 1 Megabyte. A maximum limit per user can be established during Pooled Tables installation by including the command SET MAXPOOLMEM=n in the FOCPARM file. A user will not be able to request more memory than this limit.

- *"I already create a HOLD file from my database and then report from that. Why do I need Pooled Tables?"*

With Pooled Tables, it is possible to receive even better results than this technique, without any pre-planning on the developers part! Rather than create the HOLD file, Pooled Tables will read the data only once and pass it to each of the reports in the pool. There is no I/O to write the HOLD file and, more importantly, no I/O to read the HOLD file once for each of the reports in the pool. If you already use this technique, there is no immediate need to change your application to benefit from Pooled Tables. All of the reports from the HOLD file can be pooled. This will alleviate all but the I/O to create the HOLD file and one set of I/O to read the file once for all of the reports in the pool.

- *"I have reports in two separate FOCXECs. Will they be pooled?"*

Pooling will occur across FOCXECs, as long as there are no intermediate commands between them that would create a subpool boundary. The most common subpool boundary command that would be encountered in this situation is the use of -RUN or -EXIT in the first FOCXEC. Although this is good practice in the non-Pooled Tables case, it will cause reports that could benefit from Pooled Tables to be executed separately, as they are without Pooled Tables.

- *"What happens if I provide incorrect estimates for the number of records and lines in a pooled report?"*

Your reports will still execute and you will still receive the benefit of reduced database I/O and the CPU associated with it. However, the report sorting and formatting costs may increase. With incorrect estimates, Pooled Tables may select the wrong sort or allocate too little or too much memory for the report within the pool. If too much memory is allocated, fewer reports can be executed concurrently. If too little memory is allocated, fewer records can be sorted in memory, causing additional sort work I/O. If a FOCUS sort is selected, you lose the benefit an external sort when it is more appropriate. Note, however, that Pooled Tables will have an accurate count of the selected records (ESTRECORDS) for reports in the second and subsequent iterations.

## Reference Error Processing

- Any error detected during parsing causes pooled tables to flush the remaining commands through `SET POOL = OFF`.

- Any error detected during the retrieval phase will cause Pooled Tables to abort the FOCUS session. This occurrence will display both the error message that caused the problem and error message FOC1897. The following is an example of when this may occur:

```
(FOC1070) VALUE FOR JOIN 'FROM' FIELD OUT OF SEQUENCE. RETRIEVAL ENDED
(FOC1897) FATAL ERROR DURING POOLED TABLES RETRIEVAL. FOCUS
TERMINATING.
```

- Any error detected during the output phase for a given TABLE terminates processing for that TABLE. Output processing continues for subsequent TABLE requests.
- Line numbers and FOCEXEC name may be missing in the message:  
ERROR AT OR NEAR LINE n IN PROCEDURE a

### Reference Warning/Error Messages

FOCUS warning messages (normally generated without Pooled Tables) may appear twice when running with Pooled Tables active.

Below is a list of messages generated by Pooled Tables. These appear only when FOCUS is about to be terminated.

```
(FOC1897) FATAL ERROR DURING POOLED TABLES RETRIEVAL. FOCUS
TERMINATING.
```

An error was encountered in a report during Pooled Tables retrieval. FOCUS cannot recover from this error and will return to the host environment.

(FOC1899)

### LOAD FAILED FOR EXTERNAL SORT

In preparation for an external sort under Pooled Tables, FOCUS tried to LOAD the external-sort module. The LOAD failed. (This message is produced only under VM.)

(FOC1900)

### NOT ENOUGH MEMORY FOR EXTERNAL SORT

In preparation for an external sort, available memory was queried. Not enough memory is available for an external sort. Increase memory and execute the request again.

## NF566: MSO/CICS Cooperative Processing

CICS transactions and MSO FOCEXECs may now communicate directly with each other in a synchronous mode. A CICS pseudo conversational transaction may start an MSO session on behalf of a CICS user. Once a cooperative processing session is started, data can be handed back and forth between FOCEXECs and CICS transactions in packets containing up to 256 bytes. Additionally, a suspend function is available. When this is invoked in MSO, the CICS transaction is given control. This allows a “hot” MSO to be available to the CICS user. The CICS user may go in and out of MSO without terminating their MSO session.

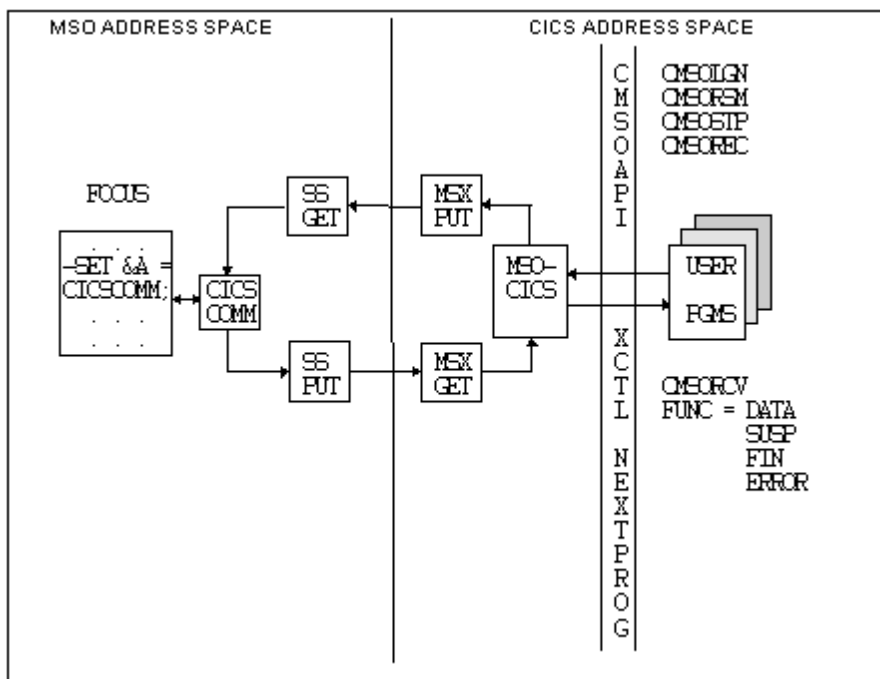
These new facilities allow CICS transactions to get and retrieve data from the MSO region and the reverse is also true. The FOCEXEC interaction is implemented in MSO via a FUSELIB routine, CICSComm.

The CICS transaction functions are implemented by linking the installation's transaction module with the IBI supplied module, CMSOAPI. CMSOAPI provides five function calls that supply the MSO/CICS communications.

Also, a reconnect facility is available for cooperative processing sessions and for standard MSO connections from CICS. This allows the reconnection of an MSO session when the logical connection from a CICS terminal is lost.

The figure below illustrates the relationship between a FOCEXEC running in the MSO address space and user programs running in the CICS address space when a cooperative session has been established.





## MSO FOCEXEC Cooperative Processing Service

The CICSCOM FUSELIB routine supplies the cooperative processing facility to FOCEXECs executing in the MSO region. It may be called from wherever a FOCUS user-written subroutine is supported. This routine is used to communicate and synchronize activity with the CICS portion of the dialog. When invoked, the FOCEXEC is placed into a wait until action is taken on the CICS side of the conversation. Data specified by the outlen/outbuf parameters is passed to CICS. When this subroutine is called it causes a CICS transaction specified in the CMSLOGN to be started in the CICS region. When CICSCOM completes, the inlen/inbuf parameters contain data that was passed back from CICS.

CICSCOM supports the following syntax:

```
CICSCOM(timeout, outlen, outbuf, inlen, inbuf);
```

where:

*timeout*

Is the number of seconds to wait for response before timing out FOCUS. If this timeout duration is reached before the CICS portion of the session responds, the MSO FOCUS session is terminated. This action is represented as a FIN function code to the CMSRCV call.

*outlen*

Is length (0-256) of the outbound message to CICS.

*outbuf*

Is the field containing the outbound message to CICS.

### *inlen*

Is the length (0-256) of the inbound message buffer.

This value is the maximum amount that can be returned by CICS. It is presented to the CICS portion of the conversation in the *outlen* parameter of the CMSORCV call.

### *inbuf*

Is the field to contain the inbound message from CICS.

## MSO/CICS Cooperative Processing Services

The CICS portion of the cooperative processing functions is provided in the IBI supplied module CMSOAPI. This module contains the functional code that supports the individual calls available to CICS transactions. When this module is link edited with a CICS transaction module, five functions become available to the module.

|         |                                                                                                |
|---------|------------------------------------------------------------------------------------------------|
| CMSOLGN | Logs a CICS user as an MSO FOCUS user and establishes a session between MSO FOCUS and CICS     |
| CMSRCV  | Interrogates MSO/CICS to identify the session that requires servicing, receiving data if sent. |
| CMSREC  | Reconnects to a session that is in an indeterminant state.                                     |
| CMSOSTP | Stops or terminates the session. This cancels the users MSO FOCUS task.                        |
| CMSORSM | Sends data back to the FOCUS portion of a session or restarts a suspended MSO FOCUS session.   |

Syntax and descriptions of the functions follow:

### **Syntax**    How to Use the CMSOLGN Function

This function starts an MSO session for the user by logging on to MSO. It defines the details of the MSO/CICS conversation processing that will take place.

```
CALL CMSOLGN(EIB, COMMAREA, MSONAME, USERWD, NEXTPROG, LOGONBUF)
```

where:

**EIB**

is the CICS Exec Interface control Block

**COMMAREA**

is the CICS Communications Area

**MSONAME**

4 byte name of MSO CICS transaction. Each MSO transaction name corresponds to a single MSO region that may be connected to.

**USERWD**

4 byte user word to associate with an MSO session

It is an arbitrary 4 byte value that is returned by CMSOLGN. It represents a unique identifier for the conversation that this service just established. It will be returned when the CMSRCV is issued to identify the specific conversation that needs to be serviced

### NEXTPROG

8 byte name of next program to call

It identifies the CICS user program that will be called when the CMSCOMM FUSELIB is invoked on the MSO side of the conversation. NEXTPROG is mutually exclusive with the LOGTRAN entry in the LOGONBUF control block. Only one of these parameters should be specified. They function identically. Cooperative processing support, that is, the ability to be called back at all, is enabled by specifying a NEXTPROG in CMSOLGN. Fill NEXTPROG with blanks or nulls if no callbacks are desired.

### LOGONBUF

Is a required control block. It should be completely initialized to blanks (x'40') before individual fields are set. Some of the fields support the MSO Load Balancing feature. The purpose of these fields are fully described in the new feature documentation for that feature.

An assembler copy file, CMSOAPIA, is supplied in MSO.DATA. This file maps the LOGONBUF. The fields and their meanings are listed in the table below. All fields are alphabetic.

| Field Name | length  | contents                                                                                                                                     |
|------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------|
| LOGAPPL    | 8 bytes | A load balancing parameter that limits MSO region selection to those service groups that specify the same application name.                  |
| LOGSERV    | 8 bytes | Specifies the particular MSO Service Group that this user should be started in. It applies to load balancing as well as a single region MSO. |

|                   |               |                                                                                                                                                                                                                                                    |
|-------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LOGTRAN           | 4 bytes       | This defines the CICS transaction that will be invoked when the CICSCOMM FUSELIB routine is called in the MSO region. It is mutually exclusive with NEXTPROG in the invocation parameters. Only one should be specified.                           |
| LOGBREAK          | 4 bytes       | Break key ( <b>PF/PAnn</b> )<br>Identifies the key that will unconditionally terminate the active MSO session.                                                                                                                                     |
| LOGSUSP           | 4 bytes       | Suspend key ( <b>PF/PAnn</b> )<br>Identifies the key that will cause the active MSO session to suspend operation. When this key is pressed, the LOGTRAN or NEXTPROG CICS transaction (whichever was specified) will be invoked in the CICS region. |
| <b>Field Name</b> | <b>length</b> | <b>contents</b>                                                                                                                                                                                                                                    |
| LOGELVL           | 4 bytes       | Error level ( <b>ALL,ERR,NONE</b> )<br>Controls what messages are displayed to the user when the MSO session ends.<br>ALL - All messages are displayed<br>ERR - Only error messages are displayed<br>NONE - No messages are displayed              |

|          |          |                                                                                                                                                                                 |
|----------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LOGGROUP | 8 bytes  | Logon group name<br>The load balancing group name. It controls the MSO load balancing group that the user will be started in.                                                   |
| LOGVALID | 1 byte   | Security check flag (N/Y)<br>Y must be specified for the reconnect service (CMSOREC call) to work. In addition, UNIQUE=LOGONID must be specified in the MSO configuration file. |
| LOGINITM | 1 byte   | Suppress initialization message flag (N/Y)<br>Y suppresses the MSO initialization message.                                                                                      |
| LOGFLAG1 | 1 byte   | reserved flag                                                                                                                                                                   |
| LOGFLAG2 | 1 byte   | reserved flag                                                                                                                                                                   |
| LOGRESV  | 20 bytes | reserved                                                                                                                                                                        |

| Field Name | length    | contents                                                                                                                                                                                                                                             |
|------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LOGACCT    | 40 bytes  | account<br>Specifies the MSO account field. This field will be recorded in the MSO SMF records when that feature is active.                                                                                                                          |
| LOGUPRM    | 256 bytes | Logon parameter<br>The contents of this field is available to FOCEXECs via the MSOINFO subroutine. It is generally used to provide control information to the MSO profile exec so that specific FOCUS applications may be invoked in the MSO region. |

## **Syntax**    How to Use the CMSORCV Function

This function is used to interrogate the MSO/CICS control program. The returned parameters identify the particular conversation that had a status change, the current status of the conversation, and any data that may have been received from MSO. It is usually the first MSO/CICS Cooperative Processing service used in the transaction that is triggered by the CICS COMM subroutine (NEXTPROG or LOGTRAN).

The **FUNCTION** field is set based on either an event in the MSO region or if an event in the CICS region caused the status. The **FUNCTION** codes that are returned are described in CMSORCV Function Codes.

```
CALL CMSORCV(EIB, COMMAREA, FUNCTION, CONNID, USERWD, INLEN, OUTLEN,
BUFFER, ERRNUM)
```



where

EIB

Is the CICS Exec Interface control Block

COMMAREA

Is the CICS Communications Area

FUNCTION

4 byte callback function code See CMSORCV Function Codes

CONNID

4 byte connect id of MSO session. This value together with USERWD uniquely define each MSO/CICS session.

USERWD

4 byte user word to associate with an MSO session. This value together with CONNID uniquely define each MSO/CICS session.

INLEN

4 byte length of buffer inbound from FOCUS

OUTLEN

4 byte length of return buffer expected by FOCUS

When using the CMSORSM, the [LENGTH](#) parameter may not exceed the value of [OUTLEN](#). If it does, the data presented to the MSO FOCEXEC is truncated to the value of [OUTLEN](#).

BUFFER

256 byte inbound data buffer

### ERRNUM

4 byte FOCUS ending error number (function FIN) or 4 This field is a binary number and is mapped by the CMSOAPIA member of MSO.DATA.  
Possible returned values are described in section: CMSORCV Function Codes.

## Syntax    How to Use the CMSOREC Function

This function re-establishes a MSO/CICS session based upon the current user's CICS id. The connect id may be supplied if known. Otherwise, the function uses a connect id of 0 and the userid to identify the session. This condition may be caused by the user powering off their terminal while an MSO/CICS session is active and then logging on to CICS again.

Security flag - If the security flag in the logon buffer is set to yes, then the resuming or reconnecting userid is validated against the known userid. The reconnection is rejected if they do not match. If present userid determination is subject to the MSCXUID exit. The default for the security flag in the logon buffer is no.

`CALL CMSOREC(EIB, COMMAREA, MSONAME, CONNID, NEXTPROG)`

where:

`EIB`

is the CICS Exec Interface control Block

`COMMAREA`

Is the CICS Communications Area

`MSONAME`

4 byte name of MSO transaction

CONNID

4 byte connect id of MSO session

NEXTPROG

8 byte name of next program to call

### Syntax    How to Use the CMSOSTP Function

This function stops an MSO/CICS session immediately. MSO must have passed control to the CICSCOMM FUSELIB program before a stop can be issued. A **CMSOSTP** received while MSO is still in control is treated as a protocol error.

```
CALL CMSOSTP(EIB, COMMAREA, MSONAME, CONNID, NEXTPROG)
```

where:

EIB

Is the CICS Exec Interface control Block

COMMAREA

Is the CICS Communications Area

MSONAME

4 byte name of MSO transaction

CONNID

4 byte connect id of MSO session

NEXTPROG

8 byte name of next program to call. This field specifies a CICS transaction to start if the current invocation fails and cannot be associated with a known session. If a session is identified then the nextprog that was specified in the CMSOLGN service for the identified session will be called.

## Syntax    How to Use the CMSORSRM Function

This function sends data to an MSO FOCUS session that previously issued the CICSCOMM FUSELIB routine or resumes an existing MSO/CICS session that was suspended by the user with the suspend key. Data may be sent in both cases but will be ignored if the session is in a suspended state. A [CMSORSRM](#) received while MSO is still in control is a protocol error. If there is data, a buffer is allocated which is freed by MSOCICS.

[CALL CMSORSRM\(EIB,COMMAREA,MSONAME,CONNID,NEXTPROG,LENGTH,BUFFER\)](#)

where:

[EIB](#)

Is the CICS Exec Interface control Block

[COMMAREA](#)

Is the CICS Communications Area

[MSONAME](#)

4 byte name of MSO transaction

[CONNID](#)

4 byte connect id of MSO session

[NEXTPROG](#)

8 byte name of next program to call

[LENGTH](#)

4 byte length of outbound buffer. Data sent to MSO FOCUS will be truncated to the original length specified by INLEN on the MSO FOCEXEC call to CICSCOMM.

[BUFFER](#)

Outbound data buffer (up to 256 bytes)

## CMSORCV Function Codes

The possible function codes that may be returned on the CMSORCV call are listed below:

| Value name | value | Meaning                                                                                                                                  | Returned Parameters                  |
|------------|-------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| IB_DATA    | 9     | Data returned<br>This is the result of<br>CICSCOMM being invoked<br>in MSO.                                                              | CONNID USERWD INLEN<br>OUTLEN BUFFER |
| IB_SUSP    | 10    | suspend key struck<br>The users MSO session is<br>dormant until CMSORM is<br>issued for it.                                              | CONNID USERWD                        |
| IB_FIN     | 11    | FOCUS session ended<br>ERRNUM contains return<br>code from the MSO FOCUS<br>session.                                                     | CONNID USERWD<br>ERRNUM              |
| IB_ERROR   | 12    | API protocol error<br>ERRNUM contains the<br>value for the error. See the<br>following table for a list of<br>errors and their meanings. | CONNID USERWD<br>ERRNUM              |
| IB_NOAPI   | 17    | Program not called by<br>MSO\CICS                                                                                                        | None                                 |

The ERRNUM values that may be associated with a function code of IB\_ERROR are:

| Error          | Value | Description                    |
|----------------|-------|--------------------------------|
| IBERR_STATE    | 1     | MSO called in invalid state    |
| IBERR_INVFUNC  | 2     | MSO called w/invalid function  |
| IBERR_SECURE   | 3     | id verification failed.        |
| IBERR_NORECON  | 4     | RECON called but not supported |
| IBERR_NOTFOUND | 5     | user not found for connect id  |

### Examples

The following sample members are supplied in MSO.DATA to aid in developing installation applications to use this feature:

|          |                                                                                                                  |
|----------|------------------------------------------------------------------------------------------------------------------|
| CCDEMO   | A FOCEXEC that implements a sample MSO menu to illustrate the function supplied by the CICS COMM FUSELIB routine |
| CCDEMOAS | Assembler source of CICS API program                                                                             |
| CCDEMOAJ | JCL to build CCDEMOA module                                                                                      |
| CCMAPS   | map source for demo program                                                                                      |
| CCMAPSAJ | JCL to build mapset and MAP DSECT                                                                                |

## **Reconnection Capability**

A CICS connection may be lost by powering off a terminal or closing an emulator session. This feature adds the capability of reconnecting to that session. Previously there was no way to do this and the user would not be allowed to re-login until the original session had timed out or been canceled by the MSO operator.

Now, a standard MSO session may be reconnected with, by specifying MSO RECON (where MSO is the CICS transaction that invokes the MSOCICS program).

An MSO/CICS cooperative processing session, one that was established via the CMSOLGN call, may be reconnected using the CMSREC call. CMSREC allows the use of conid or userid to be specified. If conid is specified then the userid of the MSO FOCUS session has to match the CICS userid only if the LOGVALID security flag was set to Y in the LOGONBUF. The reconnection is found using the userid associated with the CICS session. UNIQUE=LOGONID must have been specified in the MSO configuration file for this service to be able to reconnect.

## **Suspend key**

If the suspend key is activated in the MSO FOCUS session, it is subject to the MSO configuration setting of IDLELIM. If the session is in the suspended state long enough to set off the IDLELIM limit, the session is terminated. This condition can be avoided by defining a separate service group that has IDLELIM set to a high value and placing the cooperative processing MSO sessions into these service groups by specifying the appropriate LOGSERV parameter.

## **Previous API**

The CMSOLGN is an alternate method of starting an MSO/CICS session. The original method was documented with the Load Balancing new feature of FOCUS 7.0.5 & 7.0.6. Logon according to those specifications is still supported. More information is available in New Feature Bulletin NF554.



## NF568: DB2 Interface IF-THEN-ELSE Optimization

The DB2 interface has been enabled to improve the performance of FOCUS TABLE requests that include IF/THEN/ELSE define statements. Where applicable, the defined statements will be passed to DB2 as expressions allowing DB2 to optimize its own execution and minimize the size of the answer set returned to FOCUS.

### Usage

By issuing the new DB2 interface set command OPTIFTHENELSE, the interface will attempt to deliver as an expression to DB2 the construct of FOCUS IF/THEN/ELSE defines. The defined field must be an object of a selection test or an object of an aggregation request. The define definition may be specified in the table request or in the master file description.

### Syntax    How to Enable IF-THEN-ELSE Optimization

```
SQL {DB2} SET OPTIFTHENELSE {ON|OFF}
```

where

ON

Enables the feature

OFF

Disables the feature and is the default

**Note:** Omit the DB2 target RDBMS qualifier to issue the command if you previously issued the SET SQLENGINE command for DB2.

## Example Using IF-THEN-ELSE Optimization Without Aggregation

```
SQL DB2 SET OPTIFTHENELSE ON
DEFINE FILE DB2TABLE
DEF1 = IF (NAME EQ ' ') AND (NAME EQ 'XYZ') AND (SSNO EQ ' ') THEN 1
ELSE 0;
END
TABLE FILE DB2TABLE
PRINT SSNO NAME
WHERE DEF1 EQ 1
END
>SELECT T1.SSNO,T1. NAME FROM Creator.table T1 WHERE
> (((T1.TOTAL_NAME = ' ') AND (T1.NAME = 'XYZ')) AND
 (T1.SSNO = ' '))) FOR FETCH ONLY;
```

## Example Using IF-THEN-ELSE Optimization With Aggregation

```
DEFINE FILE DB2TABLE
DEF2 = IF NAME EQ 'NAME1' THEN 1 ELSE IF NAME EQ 'NAME2' THEN 2
 ELSE IF NAME EQ 'NAME3' THEN 3 ELSE 0 ;
END
TABLE FILE DB2TABLE
WRITE MAX.NAME IF DEF2 EQ 1
END
> SELECT MAX(T1. NAME) FROM creator.table T1 WHERE
 (((T1. NAME = 'NAME1')) FOR FETCH ONLY;
TABLE FILE DB2TABLE
WRITE MAX.NAME IF DEF2 EQ 2
END
> SELECT MAX(T1. NAME) FROM creator.table T1 WHERE (((NOT
(T1. NAME = 'NAME1')) AND (T1. NAME = 'NAME2')) FOR FETCH ONLY;
```

## Example Using IF-THEN-ELSE Optimization With Selection Criteria That Is Always False

```
DEFINE FILE DB2TABLE
DEF3=IF NAME EQ 'RITA' THEN 1 ELSE 0;
END
TABLE FILE DB2TABLE
PRINT NAME IF DEF3 EQ 2
END
> SELECT T1.NAME FROM creator.table T1 WHERE (1 = 0) FOR FETCH ONLY;
```

**Note:** Please note that DEF3 EQ 2 will never be true, thus the interface passes the where test 1=0 to DB2, denoting a not true condition and returning zero records from DB2.

## Reference Special Considerations

This new feature is enabled for SELECT statements only created as a result of FOCUS TABLE requests.

The following features are not supported:

- Decode defines
- Self-referencing or “recursive” defines
- STATIC SQL requests
- IF/WHERE DDname defines
- Partial Date selection

There is no guarantee that the SQL that is generated will improve performance for all requests. If it's found that this feature does not improve performance, OPTIFTEELSE OFF will disable this feature to initiate previous behavior.

## NF571: DB2 Interface SET ISOLATION Command

Starting with FOCUS release 7.0.8, the interface has been enabled to take advantage of the DB2 version 4 (and higher) ability to pass an SQL statement isolation level. This allows the interface to modify the isolation level for a TABLE request with the new interface SET command. The SET ISOLATION command will override the isolation level that was established at interface installation bind time. The new setting removes the requirement of binding multiple DB2 plans, each bound with different isolation levels.

### Usage

DB2 protects data being read by one user from changes (INSERT, UPDATE, or DELETE) made by other users; the isolation level setting governs the duration of the protection. The isolation level determines when shared locks on rows or data pages are released, so that rows or pages become available for updates by other users. DB2 version 4 and above allows this isolation setting to be changed at the SQL statement level. Besides the earlier DB2 supported isolation levels of CS and RR, DB2 version 4 and above has introduced the uncommitted read isolation level (UR) and in DB2 5.1, introduced the read stability isolation level (RS) and the isolation level of NC.

Please refer to the *DB2 Read/Write Interface Users Manual* for a more detailed definition of isolation level and to the appropriate DB2 manuals for a complete description of CS, RR, UR, RS and NC isolation levels and their impact on concurrency and database implications.

### Syntax    How to Set the DB2 Isolation Level

```
SQL {DB2} SET ISOLATION level
```

where:

*level*

Can be one of the following DB2 isolation levels:

RR

UR

RS

NC

Omit the DB2 target RDBMS qualifier to issue the command if you previously issued the SET SQLENGINE command for DB2.

To display the isolation level setting, issue the command SQL DB2 ?.

Issue the command SQL DB2 SET ISOLATION (without an isolation level) to revert back to the bound isolation level of the interface plan.

### **Example** Setting the DB2 Isolation Level

This example shows the SQL passed to DB2 as a result of the SET ISOLATION command:

```
SQL SET ISOLATION UR
SELECT T1.field1 FROM "creator"."table1" T1 FOR FETCH ONLY WITH UR;
SQL SET ISOLATION CS
SELECT T1.field1 FROM "creator"."table1" T1 FOR FETCH ONLY WITH CS;
```

The following is a result of the SQL DB2 ? command:

```
(FOC1424) ISOLATION LEVEL FOR TABLE REQUEST IS : CS
```

To reset the isolation to the Interface default:

```
SQL SET ISOLATION (blank)
SELECT T1.field1 FROM "creator"."table1" T1 FOR FETCH ONLY;
```

The following is a result of the SQL DB2 ? command:

(FOC1424) ISOLATION LEVEL FOR TABLE REQUEST IS :

The blank isolation level denotes the default isolation level will be used.

### Reference Special Considerations

This new feature is enabled for SELECT requests only created as a result of FOCUS TABLE requests.

This new setting cannot be used to override the required isolation level of RR for FOCUS MODIFY requests, COPY MANAGER or CACTUS/MAINTAIN applications.

RS isolation level is only available for DB2 version 5.1 (4.2).

The interface does not validate the isolation level values, so be sure that they are one of the acceptable isolation levels for the version of DB2 that is being accessed, otherwise an SQL code of -104 will occur signifying a SQL syntax error.

### Error Messages

None.

## NF572: Invisible Ordered Character and Ordered Numeric Data Type Key Support

This new feature will allow access and selection of Model 204 invisible ordered character and invisible ordered numeric fields. The interface supports these key designations with comparable abbreviations called *suffix operators*. These operators are described with the TYPE attribute in the Access File Description.

### Usage

A TYPE=IOA in the Access File will designate a Model 204 Key of invisible ordered character. A TYPE=ION would denote an invisible ordered numeric field.

Any FOCUS or EDA selection request against a field with TYPE=IOA or ION will result in a Model 204 IFFIND command with the appropriate IFFIND specification.

### Example Using TYPE=IOA and TYPE=ION to Produce an IFFIND Specification

For example, an equality test produces the following IFFIND specification:

| Suffix Operator | Model 204 KEY Type           | IFFIND Specification |
|-----------------|------------------------------|----------------------|
| IOA             | Ordered Character, invisible | IS ALPHA             |
| ION             | Ordered Numeric, invisible   | IS NUM               |

## NF572: Invisible Ordered Character and Ordered Numeric Data Type Key

A range test using LT or GT produces the following IFFIND specification:

| Suffix Operator | Model 204 KEY Type           | IFFIND Specification  |
|-----------------|------------------------------|-----------------------|
| IOA             | Ordered Character, invisible | IS ALPHA BEFORE/AFTER |
| ION             | Ordered Numeric, invisible   | IS NUM LT/GT          |

A range test using FROM-TO produces the following IFFIND specification:

| Suffix Operator | Model 204 KEY Type           | IFFIND Specification  |
|-----------------|------------------------------|-----------------------|
| IOA             | Ordered Character, invisible | IS ALPHA BEFORE/AFTER |
| ION             | Ordered Numeric, invisible   | IS NUM LT/GT          |

## Special Considerations

For a complete list and chart of all Model 204 KEY types and their corresponding IFFIND specifications, please refer to the *Model 204 Interface Users Manual*.

## Error Messages

N/A



## NF574: System 2000 Interface Trace Facility

Two new trace levels have been enabled. The traces can be used for informational or debugging purposes. You can access the SYSTEM 2000 database two ways with FOCUS or EDA: Selective or Sequential. FSTRACE will display all SYSTEM 2000 calls made by the Interface. If the selective strategy has been used, then FSTRACE1 can be used to display the SYSTEM 2000 LOCATE command with the associated parameters.

### Usage

You can store the trace information in an MVS sequential data set or CMS file, to SYSOUT in a batch job, or you can display it online at the terminal.

### Syntax    How to Invoke the System 2000 Interface Trace Facility

For Online to the screen (do not use for EDA or MSO):

```
DYNAM ALLOC F(FSTRACE) DA(*)
```

To write the trace to a file, use the appropriate allocation:

```
MVS ALLOC F(FSTRACE) DA('userid.FSTRACE') SHR REUSE LRECL(80) RECFM(F)
TSO ALLOC F(FSTRACE) DA('userid.FSTRACE') SHR REUSE LRECL(80) RECFM(F)
DYNAM ALLOC FILE FSTRACE DATASET userid.FSTRACE SHR REUSE LRECL 80 RECFM
F
```

For a batch job, to write the trace information to SYSOUT:

```
//FSTRACE DD SYSOUT=*,DCB=(LRECL=*,BLKSIZE=80,RECFM=F)
```

For CMS:

```
CMS FILEDEF FSTRACE DISK FSTRACE DATA A (LRECL 80 RECFM F
```

**Note:** Depending on the trace desired, specify FSTRACE or FSTRACE1. You must specify the MOD parameter in order to produce a complete trace listing. The FSTRACE and FSTRACE1 data sets are opened and closed for each SYSTEM 2000 request. Without the MOD disposition parameter, requests that produce multiple database accesses store only the last statement in the dataset.

## **Reference Special Consideration**

FSTRACE1 will contain less information than FSTRACE since it is restricted to SYSTEM 2000 LOCATE calls. It should contain enough information to determine interface to database communication and/or possible causes of performance degradation. When utilizing FSTRACE, it is recommended to use a RECORDLIMIT of 1 to begin with and increase this limit when needed since the FSTRACE file produced can be quite voluminous.

## **Error Messages**

N/A

## NF579: Assigning Screening Conditions to a File for Reporting Purposes

A filtering mechanism that assigns screening conditions to a file has been added to the functionality of TABLE. This enables you to declare a set of screening conditions, and assign it to a specific file, instead of constantly having to rewrite these screening conditions every time you need them.

The following example illustrates the use of filters. Both sides yield the same results.

### Without filters

```
TABLE FILE CAR ...
```

```
WHERE SEATS GT 5
```

```
TABLE FILE CAR ...
```

```
WHERE SEATS GT 5 ...
```

```
TABLE FILE CAR ...
```

```
WHERE SEATS GT 5
```

### With Filters

```
FILTER FILE CAR ...
```

```
SET FILTER= WHERE ... SEATS GT 5...
```

```
TABLE FILE CAR ...
```

```
TABLE FILE CAR ...
```

```
TABLE FILE CAR ...
```

```
TABLE FILE CAR ...
```

Whenever a TABLE request is made against a file, all filters that have been activated for that file are in effect. A filter is a packet of definitions that resides at the file level, containing IF and/or WHERE statements. Once these conditions have been declared, you may deactivate and reactivate them as needed for your reporting purposes.

### Using Filters

A filter is an IF or WHERE statement that is automatically added to every TABLE against that file as if the IF or WHERE were actually coded by the user. All IF/WHERE syntax that is valid in a TABLE is valid in a filter. A filter can be declared at any time before the TABLE request, and remains in effect after the TABLE request has been executed. There can be one or more filters declared for a file.

Just declaring a filter for a file does not make it active. A filter must be activated with a SET command to be in effect.

Filters allow you to:

- Declare a common set of screening conditions that apply to all extracts from a file.
- Declare a set of screening conditions and dynamically turn them on and off.
- Reduce repetitive ad hoc typing.
- Implement DBA capabilities that are not tied to the Master File Description.

### Syntax    How to Declare a Filter

A filter can be described by the following declaration:

```
FILTER FILE filename [CLEAR/ADD]
 [filter-defines;]
 NAME=filtername1 [,DESC=text]
 if-where-statements
 ...
 NAME=filternamen [,DESC=text]
 if-where-statements
END
```

where:

*filename*

Is the name of master to be used in subsequent TABLE commands

*filter-defines*

Are virtual fields declared for use in filters. For more information, see [Filter Defines](#).

NAME

Identifies the start of the declaration of a new filter

*filtername*

Is the name by which the filter is referenced in subsequent SET FILTER commands. Filtername may be up to 8 characters in length and must be unique for a particular filename.

CLEAR

Releases any previously declared filters.

ADD

Enables you to specify additional filters without releasing existing ones.

DESC

Describes the filter. Text must fit on one line for documentation purposes.

END

Terminates the filter

*if-where-statements*

Are screening conditions that can include all valid syntax. May not refer to defined fields declared via DEFINE FILE. May refer to Database fields, defines in the Master. May not refer to other filternames.

## **Reference Filter Defines**

- Are exclusively local to (usable by) filters in the filter block.
- Are not referenceable by DEFINE FILE DEFINES or TABLE.
- Support any syntax valid for DEFINES in DEFINE FILE.
- Cannot reference DEFINES from DEFINE FILE but can reference DEFINES in the Master File Description.
- Do not count toward the 256 verb object limit of TABLE unlike DEFINES from DEFINE FILE when referenced explicitly or implicitly.
- Must all be declared before the first named filter.
- Must each end with a semi-colon
- Cannot be enclosed between DEFINE FILE/END commands.

## **Example Using Filters**

The following example replaces the filter UK, with a new WHERE condition. It also adds to the CAR file's set of filter-defines, a definition for "MARK\_UP". When the TABLE command is issued for CAR, and UK is activated, the condition WHERE MARK\_UP is greater than 1000 is automatically added to the TABLE request.

Note: The field MARK\_UP cannot be explicitly displayed or referenced in the TABLE.

```
FILTER FILE CAR ADD
MARK_UP/A16=RCOST-DCOST;
NAME=UK
WHERE MARKUP GT 1000
END
TABLE FILE CAR
PRINT
```

The following example declares three named filters for the CAR file; ASIA, UK, and LUXURY. The filter ASIA is given a textual description, for documentation purposes only. The CLEAR on the first line erases any named filters that had existed for CAR, as well any filter DEFINES for CAR, before it processes the new definitions.

```
FILTER FILE CAR CLEAR
NAME=ASIA,DESC=Asian cars only
IF COUNTRY EQ JAPAN
NAME=UK
IF COUNTRY EQ ENGLAND
NAME=LUXURY
IF RETAIL_COST GT 50000
END
```

### Syntax    How to Activate/Deactivate Filters

Filters can be activated and deactivated with the following SET command:

```
SET FILTER {*_xx[yy zz]} IN file {ON|OFF}
```

where:

\*

Denotes all declared filters (default)

ON

Activates the filter.

OFF

Deactivates the filter (default).

xx

Is the name of a filter as declared in the NAME = syntax of the FILTER FILE block

The following is an example of filter activation and deactivation:

```
SET FILTER = UK LUXURY IN CAR ON
...
TABLE FILE CAR
PRINT COUNTRY NAME MODEL RETAIL_COST
END
...
SET FILTER = LUXURY IN CAR OFF
TABLE FILE CAR
PRINT COUNTRY NAME MODEL RETAIL_COST
END
```

The first SET FILTER activates CAR's filters, UK and LUXURY, and applies the conditions their filters contain to any subsequent TABLE request of CAR. The second SET FILTER, deactivates the filter named LUXURY of CAR. Any subsequent TABLE request (unless LUXURY is activated again) of CAR will not apply the conditions in LUXURY but continues to apply UK.

### Syntax Filter Query

In order to find out the status of any existing filters, use the following syntax:

```
? FILTER [{file|*}] [SET] [ALL]
```

where:

*file*

Is the name of a database master



\*

Displays filters for all files that have filters declared

SET

Displays only active filters

ALL

Displays all information about the filter including its description and the exact IF/WHERE definition.

### Example Querying Filters

The following is an example of querying filters:

```
? FILTER
```

```
NO FILTERS DEFINED
```

or

```
Set File Filter name Description

 CAR ROB Rob's selections
* CAR PETER Peter's selections for CAR
* EMPLOYEE DAVE Dave's tests
 EMPLOYEE BRAD Brad's tests

? FILTER CAR

NO FILTERS DEFINED FOR FILE NAMED CAR
```

or

```
Set File Filter name Description

 CAR ROB Rob's selections
* CAR PETER Peter's selections for CAR

? FILTER * SET
Set File Filter name Description

* CAR PETER Peter's selections for CAR
* EMPLOYEE DAVE Dave's tests
```

## Filters and JOINS

Filters against a file are suspended (but not erased) when that file is the object of a JOIN. Filters against the primary file of a JOIN may be re-declared or be entirely different, may reference only fields in the JOINed structure and are in effect until the JOIN is cleared. At that time the pre-JOIN filters are brought back. Filters against the secondary JOIN file(s) remain alive as originally declared.

```
_*****
-* JOIN AND FILTER INTERACTION
_*****

-* DECLARE A FILTER
FILTER FILE EMPLOYEE CLEAR
 NAME=XXX WHERE JOBCODE EQ 'A01'
END
SET FILTER = XXX IN EMPLOYEE ON
-* EMPLOYEE FILE SHOWS JOBCODE A01 ONLY
TABLE FILE EMPLOYEE PRINT EMP_ID JOBCODE
END
-* -----
-* NOW JOIN TO JOBFILE AND REDECLARE THE SAME FILTER TO A DIFFERENT VALUE
-* -----
JOIN JOBCODE IN EMPLOYEE TO JOBCODE IN JOBFILE
FILTER FILE EMPLOYEE
 NAME=XXX WHERE JOBCODE EQ 'A07'
END
-* (NOTE: NEW FILTER FOR JOIN STRUCTURE IS NOT ACTIVATED YET)
-* EMPLOYEE FILE SHOWS **ALL** JOBCODES (ORIGINAL FILTER TURNED OFF BY
JOIN)
TABLE FILE EMPLOYEE PRINT EMP_ID JOBCODE
END
-* -----
-* NOW TURN ON THE NEW FILTER THAT APPLIES TO THE JOIN STRUCTURE
-* -----
SET FILTER = XXX IN EMPLOYEE ON
-* SHOWS JOBCODE A07 (NOT A01) (NEW FILTER APPLIES TO JOIN ONLY)
TABLE FILE EMPLOYEE PRINT EMP_ID JOBCODE
END
-* NOW CLEAR THE JOIN TO RE-ESTABLISH THE ORIGINAL FILTER
JOIN CLEAR *
-* NOW SHOWS JOBCODE A01 ONLY, AS BEFORE (ORIGINAL FILTER REACTIVATED)
```

```
TABLE FILE EMPLOYEE PRINT EMP_ID JOBCODE
END
```

### Reference Special Consideration

The maximum number of filters set 'ON' for a file is limited by the number of IF/WHERE statements in these filters, not to exceed the standard FOCUS limit of IF/WHERE statements in any single TABLE.

The SET FILTER command is limited to one line. To activate more filters than fit on one line, repeat the SET FILTER command. As long as you specify 'ON' the effect is additive, not one of replacement. For example,

```
SET FILTER A B C IN CAR ON
SET FILTER D E F IN CAR ON
SET FILTER G IN CAR OFF
```

activates A, B, C, D, E, F and deactivates G (assuming that it was set ON previously).

### Reference Error Messages

```
(FOC 36237) SYNTAX ERROR SETTING FILTER
(FOC36241) FILTERS DON'T EXIST FOR FILE NAMED:
(FOC36242) FILTER DOESN'T EXIST
```

## NF583: Teradata Outer Join Optimization

This feature improves the Teradata Relational Interface performance by enabling the interface to deliver better optimized SQL to the Teradata RDBMS, permitting the RDBMS to optimize its own join processing.

The interface now passes left outer joins to Teradata when you issue the FOCUS command

```
SET ALL=ON
```

(**Note:** SET ALL=ON previously disabled optimization, leaving FOCUS to handle the join).

Optimization of outer joins is available for the interface installed with Teradata TOS version 1 release 5.1 and higher or Teradata version 2 release 2 and higher. The Teradata version is specified by the REL= parameter of the Teradata Installation procedure GENFDBC.

### Syntax How to Invoke Teradata Outer Join Optimization

```
SET ALL=ON
```

```
SQL SET OPTIMIZATION ON
```

### Example Invoking Teradata Outer Join Optimization

This example shows the SQL passed to Teradata for a FOCUS dynamic join with SET ALL=ON, SQL SET OPTIMIZATION ON:

```
JOIN field1 IN file1 TO field2 IN file25
```

```
SELECT T1.field1,T2.field2 FROM "creator.table1" T1 LEFT OUTER JOIN
"creator.table2" T2 ON T2.field2 = T1.field1 FOR FETCH ONLY;
```

## **Special Considerations**

- The SET ALL=ON command also controls processing of short paths. The interface default setting is OFF. For a complete description of short path processing, please refer to your Interface Users Guide.
- Please be aware that in passing requests to Teradata with SET ALL=ON, you may get correct, yet subtly different, sequences of report rows than you had with earlier releases of the Interface. These differences are due to differences between sorting algorithms used by FOCUS and by Teradata, and do not indicate upward compatibility problems.

## **Error Messages**

N/A

## NF586: Expanding Byte Precision for COUNT and LIST

The COUNT and LIST verbs may now optionally be expanded from 5 to 9 characters on display. This internally reformats COUNT and LIST from I5 to I9.

### Usage

Before FOCUS Release 7.0.8, if the number of records retrieved for a field exceeded 5 bytes, asterisks were displayed in the report. This indicates an overflow condition, meaning that the display must be increased. The new maximum value for COUNT and LIST is 999,999,999.

### Syntax    How to Set the Precision for COUNT and LIST

```
SET COUNTWIDTH = {ON|OFF}
```

where OFF is the default.

### Example    Setting Precision for COUNT and LIST

The following example shows the COUNT verb with behavior prior to FOCUS Release 7.0.8:

```
TABLE FILE filename
COUNT Fldxx
BY Fldyy
END
```

```
 FLDxx
Fldyy COUNT
value *****
```

The following example shows the COUNT verb with behavior as of FOCUS Release 7.0.8 with SET COUNTWIDTH = ON:

```
TABLE FILE filename
COUNT Fldxx
BY Fldyy
END

 FLDxx
Fldyy COUNT
value 999999999
```

### Special Considerations

This feature will affect the width of a report when the COUNTWIDTH is set to ON. Calculating the LRECL of a report will now require an additional 4 bytes for each COUNT and LIST column.

### Error Messages

None.



## NF593: IUCV CMS SU

Inter-user communications vehicle is now supported for CMS SU. This is a desirable protocol as the master processor is not enqueued serially per request. IUCV also offers performance gains when compared to the VMCF communications protocol.

IUCV is not supported for any release prior to R7.0.8. If any earlier release of FOCUS is used with an IUCV server the results are unpredictable. Please see the Simultaneous Usage Reference Manual, CMS Version (DN 1000015.0797)

## NF594: JAVA Report Assist

Java Report Assist provides a user-friendly environment for creating ad hoc reports in HTML, WP, DF or Lotus formats. The Report Assistant supports automatic generation of complete record selection criteria, sort fields, headings and footings, subtotals, and calculations.

Complete documentation for the Web Interface product can be found in the Web Interface User's Manual and Installation Guide Release 7.0.8 (DN1001038.1097).

## NF605: Date Handling for the Year 2000 in FOCUS

As part of our year 2000 compliance effort we have changed the default date format display in FOCUS. The new format is MMDDCCYY.

### Usage

The two digit century, has been added to the year portion of the display. This applies to all areas within FOCUS that display a date. They include:

- The FOCUS Banner
- ? REL
- ? FILE
- ? FDT
- MODIFY FILE FN
- CREATE FILE FN
- FSCAN FILE FN
- REBUILD TIMESTAMP

A 4 digit year is written into the FOCUS file in the format of CCYY. Prior to Release 7.0.8, YY was written into page 1 of the FOCUS file.

### Example Displaying Four-digit Years in FOCUS

Entering ? REL at the FOCUS prompt displays a screen similar to the following:

```
>
? REL
FOCUS 7.0.8 CREATED 11/20/1997
```

## Date Literals Interpretation Table

This table illustrates the behavior of FOCUS date formats. The columns indicate the number of input digits for a date format. The rows indicate the usage or format of the field. The intersection of row and column describes the result of input and format.

|      | 1       | 2       | 3          | 4          |
|------|---------|---------|------------|------------|
| YYMD | *       | *       | CC00/0m/dd | CC00/mm/dd |
| MDYY | *       | *       | *          | *          |
| DMYY | *       | *       | *          | *          |
| YMD  | *       | *       | CC00/0m/dd | CC00/mm/dd |
| MDY  | *       | *       | *          | *          |
| DMY  | *       | *       | *          | *          |
| YYM  | CC00/0m | CC00/mm | CC0y/mm    | CCyy/mm    |
| MYY  | *       | *       | *          | *          |
| YM   | CC00/0m | CC00/mm | CC0y/mm    | CCyy/mm    |
| MY   | *       | *       | 0m/CCyy    | mm/CCyy    |
| M    | 0m      | mm      | *          | *          |
| YYQ  | CC00/q  | CC0y/q  | CCyy/q     | 0yyy/q     |

|     | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
|-----|----------|----------|----------|----------|
| QYY | *        | *        | q/CCyy   | *        |
| YQ  | CC00/q   | CC0y/q   | CCyy/q   | 0yyy/q   |
| QY  | *        | *        | q/CCyy   | *        |
| Q   | q        | *        | *        | *        |
| JUL | CC00/00d | CC00/0dd | CC00/ddd | CC0y/ddd |
| YY  | 000y     | 00yy     | 0yyy     | yyyy     |
| Y   | 0y       | yy       | *        | *        |
| D   | 0d       | dd       | *        | *        |
| W   | w        | *        | *        | *        |

|      | <b>5</b>   | <b>6</b>   | <b>7</b>   | <b>8</b>   |
|------|------------|------------|------------|------------|
| YYMD | CC0y/mm/dd | CCyy/mm/dd | 0yyy/mm/dd | yyyy/mm/dd |
| MDYY | 0m/dd/CCyy | mm/dd/Ccyy | 0m/dd/yyyy | mm/dd/yyyy |
| DMYY | 0d/mm/CCyy | dd/mm/Ccyy | 0d/mm/yyyy | dd/mm/yyyy |
| YMD  | CC0y/mm/dd | CCyy/mm/dd | 0yyy/mm/dd | yyyy/mm/dd |
| MDY  | 0m/dd/CCyy | mm/dd/Ccyy | 0m/dd/yyyy | mm/dd/yyyy |

|     | <b>5</b>   | <b>6</b>   | <b>7</b>   | <b>8</b>   |
|-----|------------|------------|------------|------------|
| DMY | 0d/mm/CCyy | dd/mm/Ccyy | 0d/mm/yyyy | dd/mm/yyyy |
| YYM | 0yyy/mm    | yyyy/mm    | *          | *          |
| MYM | 0m/yyyy    | mm/yyyy    | *          | *          |
| YM  | 0yyy/mm    | yyyy/mm    | *          | *          |
| MY  | 0m/yyyy    | mm/yyyy    | *          | *          |
| M   | *          | *          | *          | *          |
| YYQ | yyyy/q     | *          | *          | *          |
| QYY | q/yyyy     | *          | *          | *          |
| YQ  | yyyy/q     | *          | *          | *          |
| QY  | q/yyyy     | *          | *          | *          |
| Q   | *          | *          | *          | *          |
| JUL | CCyy/ddd   | *          | *          | *          |
| YY  | *          | *          | *          | *          |
| Y   | *          | *          | *          | *          |
| D   | *          | *          | *          | *          |
| W   | *          | *          | *          | *          |

- CC stands for two century digits provided by DFC/YRT settings.
- \* stands for error message FOC177 (invalid date constant).
- FOCUS reads date literals from right to left.

## **Special Considerations**

N/A

## **Error Messages**

(FOC177)

**INVALID DATE CONSTANT:**

The constant in the calculation is not a valid date. Enter a valid date.

## NF607: TABLA Enhancements

### (Default Space Allocation Table for Work Files)

FOCUS output datasets not allocated by the user are allocated dynamically by FOCUS itself. The default space attributes associated with each dynamically allocated ddname are now set by editing the member IBITABLA in the PDS called FOCCTL.DATA.

In order to change the defaults for these FOCUS output datasets, the file IBITABLA must be copied to a dataset allocated to the DDname ERRORS. The file is a fixed columnar file. All changes must be made in the appropriate column. The columns are:

| Column name                           | Starting column | length |
|---------------------------------------|-----------------|--------|
| DDname                                | 01              | 8      |
| Allocation units ( <u>CYLS</u> ,TRKS) | 10              | 4      |
| Primary space                         | 15              | 3      |
| Secondary space                       | 19              | 3      |
| Number of Directory entries (PDS)     | 23              | 2      |
| Sysout class (OFFLINE only)           | 26              | 1      |
| Volume                                | 28              | 6      |
| Unit (SYSDA,DASD,HIPER,NOHIPER*,etc)  | 35              | 8      |
| Unit Count (FOCPoolT only)            | 44              | 2      |

- \* Use NOHIPER as a unit name to exclude particular datasets from HiperFOCUS.



If the file IBITABLA is not available in a PDS allocated to the ddname ERRORS, the defaults are in affect for all FOCUS output datasets. The default for all FOCUS output datasets except FOCPOOLT is 5 CYLs with secondary extent size of 5. The default for FOCPOOLT is 5 CYLs with secondary extent size of 20.

### Example Sample IBITABLA

This is a copy of IBITABLA as shipped.

```
* DDNAME*A.UN*SP1*SP2*DR*C*VOLUME* UNIT *UC* FIELD NAME
0-----1---1---1---2--2-2-----3-----4- STARTING
1-----0---5---9---3--6-8-----5-----4- COLUMN
---8-----4-- -3- -3- 2- 1 --6--- --8--- 2- LENGTH
HOLD CYLS 5 5 , /* 1 */
HOLDMAST TRKS 5 5 36 , /* 2 */
SAVE CYLS 5 5 , /* 3 */
REBUILD CYLS 5 5 , /* 4 */
FOCSML CYLS 5 5 , /* 5 */
FOCUS CYLS 5 5 , /* 6 */
FOCSTACK TRKS 5 5 , /* 7 */
FOCSORT CYLS 5 5 , /* 8 */
OFFLINE CYLS 5 5 A , /* 9 */
SESSION TRKS 5 5 , /*10 */
FOCCOMP TRKS 5 5 12 , /*11 */
HOLDACC TRKS 5 5 12 , /*12 */
FMU TRKS 5 5 12 , /*13 */
TRF TRKS 5 5 12 , /*14 */
FOCPOOLT CYLS 5 20 2, /*15 */
*
*
* The UC or unit count column may be specified for FOCPOOLT only.
***** Bottom of Data

```

## Special Consideration

This New Feature document supersedes Section 3.14 'Default Space Allocation Table for Work Files: TABLA' in the *FOCUS MVS/TSO Installation Guide* (DN1000994.0295, DN1000994.0896, or DN1000994.1097).\_

## Error Messages

If the old method is used and the installer attempts to link TABLA into module FOCUS, there is now a U593 abend at FOCUS initialization.

## NF609: Sink Validation of Userids in CMS

A new file has been created in CMS to help verify who may connect to a specific CMS sinkid.

### Usage

A filename called FOCSUACC, with FILETYPE = DATA and FILEMODE = A1, can be created on the A disk of the CMS sink id. The DCBs of the file are as follows: LRECL 80 RECFM F BLKSIZE 80. You may code up to eight-character userids in this file. They are coded one per line in the file. When HLIMAIN or IUCVMAIN programs initialize, a search is performed for this file. If it's found, all of the userids stored in the file are read into a list in memory. This list is then used to verify who may connect to this CMS sink id with READ and/or WRITE access. If a client tries to connect to the sinkid and their userid doesn't exist in the FOCSUACC DATA file, an error message is displayed. This provides an equivalent of MVS SUSI for the CMS SU product.

### Examples

Verification that this feature is working can be simply tested. For example, if FOCSUACC DATA A has two userids coded on two lines, and you start the sink, and attempt to connect with a third userid that is not coded in FOCSUACC DATA an error will display after the first request for data from the sink.

### Special Considerations

ENCRYPT FILE is not supported for this feature.

### Error Messages

(FOC517) SU. ACCESS DENIED BY EXTERNAL SECURITY SYSTEM:

## NF617: Automatic Allocation of FOCUS Files

The automatic allocation of FOCUS files in MVS FOCUS was removed from FOCUS Release 7.0.1. This was a dramatic change from prior releases where TABLE, MATCH, MODIFY, etc. commands would search the catalog for 'prefix.master.FOCUS'. If the file is found, the allocation for the file would be made automatically. This change was made for performance reasons.

### Usage

With the new SET command activated before running a TABLE, MODIFY, or MATCH, etc. request, FOCUS dynamically issues the equivalent of a DYNAM ALLOC or TSO ALLOC.

### Syntax    How to Activate or Deactivate Automatic Allocation of FOCUS Files

```
SET FOCALLOC = {ON|OFF}
```

where OFF is the default.

### Example    Activating and Deactivating Automatic Allocation of FOCUS Files

The following shows a TABLE request and its result in any FOCUS Release between 7.0.1. and 7.0.7, without any previous allocation to the EMPLOYEE file:

```
TABLE FILE EMPLOYEE
PRINT EMP_ID
END
```

```
(FOC036) NO DATA FOUND FOR THE FOCUS FILE NAMED: EMPLOYEE
```

The same TABLE request in FOCUS Release 7.0.8, without any previous allocation to the EMPLOYEE file, but after setting FOCALLOC on, yields a report with all of the EMP\_ID records in the EMPLOYEE file.

### **Reference Special Considerations**

? SET ALL shows this feature in its list. ? SET does not show this feature in its list. This is an MVS only feature.

### **Error Messages**

None.

## NF619: -HTMLFORM SAVE

FOCUS 7.0.8 introduces a new -HTMLFORM SAVE feature for the WEB Interface. With this feature, you can save html content generated by the -HTMLFORM command to a file, rather than to the screen. All FOCUS amper variables (&var) and escape sequences (e.g., '!IBI.AMP.varname') will be fully resolved in the external file.

### Usage

This feature may be useful for those wishing to use FOCUS to generate HTML content in batch mode, rather than interactively.

### Syntax Using -HTMLFORM SAVE

```
-HTMLFORM BEGIN SAVE AS filename
```

or

```
-HTMLFORM htmlfile SAVE AS filename
```

where:

*filename*

Is a 1 to 8 character filename of the file that will receive the html output from -HTMLFORM.

*htmlfile*

Is a 1 to 8 character filename of a source file containing HTML that you wish to save as output of -HTMLFORM.

In CMS FOCUS, this creates an html file named filename with a filetype of HTML.

In MVS FOCUS (TSO or MSO), this creates an html extract file in one of three ways:

- If ddname 'filename' is allocated, to either a sequential file or a member of a partitioned dataset, the html is written to that file.
- If ddname 'filename' is not allocated, but ddname 'HTML' is allocated to a partitioned dataset, the file is written to the HTML PDS as member 'filename.'
- If neither 'filename' nor 'HTML' is allocated, the file is written to a temporary sequential file using ddname 'filename'.

In each case, this HTML file can then be copied to a Web server for display to end users' browsers.

### **Special Consideration**

Complete documentation for the Web Interface product can be found in the Web Interface User's Manual and Installation Guide Release 7.0.8 (DN1001038.1097).

### **Error Messages**

FOC36235 - AS KEYWORD NOT SPECIFIED FOLLOWING SAVE

## NF620: Year 2000 Subroutines

Enhancements have been made to subroutines that handle dates. All subroutines that perform date calculations or perform date format conversions support dates including and after the year 2000. This change was made to coincide with our Year 2000 project.

The subroutines that were re-written for Year 2000 are:

|        |                                                                                                          |
|--------|----------------------------------------------------------------------------------------------------------|
| AYMD   | Adds and subtracts days from a date.                                                                     |
| AYM    | Adds and subtracts months from a date.                                                                   |
| YM     | Finds the number of months between two dates.                                                            |
| CHGDAT | Rearranges the year, month and day portions of dates, and connects dates between long and short formats. |
| JULDT  | Converts dates in year-month-day format into Julian format.                                              |
| GREGDT | Converts Julian dates to year-month-day dates.                                                           |
| DAxxx  | Converts dates into number of days elapsed.                                                              |
| DTxxx  | Converts the number of days elapsed into date usage.                                                     |

### Usage

The new versions of these date subroutines are used by default.



### Syntax    How to Choose a Version of a Subroutine

```
SET DATEFNS = {ON|OFF}
```

where:

ON

is the default.

If you require the older version which does not have Year 2000 capabilities, deactivate this feature by setting DATEFNS = OFF.

### Example Using Subroutines With Year 2000 Capabilities

The following FOCEXEC shows a straight conversion on the input to the subroutine.

```
SET DEFCENT=19,YRTHRESH=50
DYNAM ALLOC FILE DATE DS PMSPAK.DATE.FOCUS SHR REV
TABLE FILE DATE
ON TABLE SUBHEAD
" THIS EXAMPLE ILLUSTRATES THE USE OF THE THIRD PARAMETER IN THE "
" SUBROUTINE CALL. THE INPUT FIELD IS AN I6YMD FORMAT. IT CONTAINS "
" 2 DIGIT YEARS. SETTING A PIVOT YEAR OF 1950 RESULTS IN CONVERSION "
" TO A FULL 4 DIGIT YEAR VIA THE FORMAT OF 'I8'. "
PRINT D2_I6YMD AND COMPUTE
X/I8YMD=AYMD(D2_I6YMD,1,'I8');
END
```

### Output:

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THIS EXAMPLE ILLUSTRATES THE USE OF THE THIRD PARAMETER IN THE SUBROUTINE CALL. THE INPUT FIELD IS AN I6YMD FORMAT. IT CONTAINS 2 DIGIT YEARS. SETTING A PIVOT YEAR OF 1950 RESULTS IN CONVERSION TO A FULL 4 DIGIT YEAR VIA THE FORMAT OF 'I8'.

| D2_I6YMD | X          |
|----------|------------|
| -----    | -          |
| 97/09/16 | 1997/09/17 |
| 00/02/29 | 2000/03/01 |
| 01/02/28 | 2001/03/01 |
| 00/02/28 | 2000/02/29 |

The following example demonstrates giving the subroutine a 4 digit year as input.

```
DYNAM ALLOC FILE DATE DS PMSPAK.DATE.FOCUS SHR REU
TABLE FILE DATE
ON TABLE SUBHEAD
" START WITH A COMPUTED FIELD CALLED A. IT HAS A PIVOT YEAR OF 1950."
" CONVERTING IT FROM I6YMD TO YYMD SETS THE CENTURY DIGITS TO '20' "
" FOR THOSE YEARS WHICH ARE LT 50. CREATE OLD DATE FIELD B. "
" PASS B INTO THE AYMD SUBROUTINE ADDING 1 DAY TO THE DATE. "
PRINT D2_I6YMD AND COMPUTE
A/YYMD DFC 19 YRT 50 = D2_I6YMD;
B/I8YYMD=A;
C/I8YYMD=AYMD(B,1,C);
END
```

Output:

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Start with a computed field called A. It has a pivot year of 1950. Converting it from I6YMD to YYMD sets the century digits to '20' for those years which are less than 50. Create old date field B. Pass B into the AYMD subroutine adding 1 day to the date.

```
D2_I6YMD A B C

97/09/16 1997/09/16 1997/09/16 1997/09/17
00/02/29 2000/02/29 2000/02/29 2000/03/01
01/02/28 2001/02/28 2001/02/28 2001/03/01
00/02/28 2000/02/28 2000/02/28 2000/02/29
```

Date Literals Interpretation Table

This table illustrates the behavior of FOCUS date formats. The columns indicate the number of input digits for a date format. The rows indicate the usage or format of the field. The intersection of row and column describes the result of input and format.

|      | 1 | 2 | 3          | 4          |
|------|---|---|------------|------------|
| YYMD | * | * | CC00/0m/dd | CC00/mm/dd |
| MDYY | * | * | *          | *          |
| DMYY | * | * | *          | *          |
| YMD  | * | * | CC00/0m/dd | CC00/mm/dd |
| MDY  | * | * | *          | *          |

|     | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
|-----|----------|----------|----------|----------|
| DMY | *        | *        | *        | *        |
| YYM | CC00/0m  | CC00/mm  | CC0y/mm  | CCyy/mm  |
| MYM | *        | *        | *        | *        |
| YM  | CC00/0m  | CC00/mm  | CC0y/mm  | CCyy/mm  |
| MY  | *        | *        | 0m/CCyy  | mm/CCyy  |
| M   | 0m       | mm       | *        | *        |
| YYQ | CC00/q   | CC0y/q   | CCyy/q   | 0yyy/q   |
| QYY | *        | *        | q/CCyy   | *        |
| YQ  | CC00/q   | CC0y/q   | CCyy/q   | 0yyy/q   |
| QY  | *        | *        | q/CCyy   | *        |
| Q   | q        | *        | *        | *        |
| JUL | CC00/00d | CC00/0dd | CC00/ddd | CC0y/ddd |
| YY  | 000y     | 00yy     | 0yyy     | yyyy     |
| Y   | 0y       | yy       | *        | *        |
| D   | 0d       | dd       | *        | *        |
| W   | w        | *        | *        | *        |

|      | <b>5</b>   | <b>6</b>   | <b>7</b>   | <b>8</b>   |
|------|------------|------------|------------|------------|
| YYMD | CC0y/mm/dd | CCyy/mm/dd | 0yyy/mm/dd | yyyy/mm/dd |
| MDYY | 0m/dd/CCyy | mm/dd/Ccyy | 0m/dd/yyyy | mm/dd/yyyy |
| DMYY | 0d/mm/CCyy | dd/mm/Ccyy | 0d/mm/yyyy | dd/mm/yyyy |
| YMD  | CC0y/mm/dd | CCyy/mm/dd | 0yyy/mm/dd | yyyy/mm/dd |
| MDY  | 0m/dd/CCyy | mm/dd/Ccyy | 0m/dd/yyyy | mm/dd/yyyy |
| DMY  | 0d/mm/CCyy | dd/mm/Ccyy | 0d/mm/yyyy | dd/mm/yyyy |
| YYM  | 0yyy/mm    | yyyy/mm    | *          | *          |
| MY   | 0m/yyyy    | mm/yyyy    | *          | *          |
| YM   | 0yyy/mm    | yyyy/mm    | *          | *          |
| MY   | 0m/yyyy    | mm/yyyy    | *          | *          |
| M    | *          | *          | *          | *          |
| YYQ  | yyyy/q     | *          | *          | *          |
| QYY  | q/yyyy     | *          | *          | *          |
| YQ   | yyyy/q     | *          | *          | *          |
| QY   | q/yyyy     | *          | *          | *          |

|     | 5        | 6 | 7 | 8 |
|-----|----------|---|---|---|
| Q   | *        | * | * | * |
| JUL | CCyy/ddd | * | * | * |
| YY  | *        | * | * | * |
| Y   | *        | * | * | * |
| D   | *        | * | * | * |
| W   | *        | * | * | * |

- CC stands for two century digits provided by DFC/YRT settings.
- \* stands for error message FOC177 (invalid date constant).
- FOCUS reads date literals from right to left.

## Reference Special Considerations

You may need to deactivate the new subroutines if you are hardcoding the century digits based on specific years. The windowing technique determines what the century digits should be for each subroutine call.

## NF623: Increasing the Number of Verbs in a Report Request

The number of verbs for a multi-verb request, has been increased from 6 to 16.

### Usage

This is extremely useful for executing complex reports. The original requirement of having the detail verb last still applies. In other words, PRINT or LIST must be coded last in the list. The aggregation verb (SUM or COUNT) is coded prior to PRINT or LIST.

### Syntax

Not applicable

### Example Repeating Aggregation of the PCT\_INC Field

The following example shows a repeating aggregation of the PCT\_INC field out of the EMPLOYEE FOCUS file. This example has 15 verb objects, which are aggregated, and 1 verb object, which lists the detail records for LAST\_NAME and FIRST\_NAME. The CURR\_SAL field is also counted for the total number of records, which passed the IF on DEPARTMENT. The resulting report is an effective illustration of how this feature is used.

```
TABLE FILE EMPLOYEE
SUM PCT_INC
SUM PCT_INC
SUM PCT_INC
SUM PCT_INC
SUM PCT_INC
SUM PCT_INC
SUM PCT_INC
SUM PCT_INC
SUM PCT_INC
SUM PCT_INC
SUM GROSS
SUM DED_AMT
SUM SALARY
SUM ED_HRS
SUM CNT.CURR_SAL BY DEPARTMENT
LIST LAST_NAME FIRST_NAME
BY DEPARTMENT BY EMP_ID
IF DEPARTMENT EQ 'PRODUCTION'
END
```

### Special Considerations

Not Applicable

### Reference Error Messages

If another SUM PCT\_INC is added to the above request a diagnostic displays:

```
(FOC019) THERE ARE TOO MANY VERBS IN THE REQUEST BYPASSING TO END OF
 COMMAND
```

The total number of verbs in the request would be 17 which exceeds the new limit. This is the same error message that displays in releases prior to R7.0.8 when the old limit of 6 is exceeded.



## NF626: JAVA Graph Wizard

Java Graph Wizard guides a user step-by-step through creating a graph. The Graph Wizard is an alternative to stored graph procedures and generates FOCUS graph syntax from the user's input.

Complete documentation for the Web Interface product can be found in the *Web Interface User's Manual and Installation Guide Release 7.0.8* (DN1001038.1097).

# NF628: Automatic Activation of Web Interface for Web Browser Users

Beginning with Release 7.0.8, FOCUS automatically activates the interactive Web environment for FOCUS Web Interface users entering via the Web Interface Server or WEB390.

## Usage

FOCUS automates the activation of this environment by internally issuing two SET commands (see “Syntax” below).

## Syntax    How to Activate the Web Interface

```
SET HTMLMODE=ON
SET ONLINE-FMT=HTML
```

## Examples

N/A - see “Syntax.”

## Special Consideration

Sites wishing to activate the Web environment for FOCUS Web Interface users on a selective basis, can do so by turning the SET commands off and reissuing them selectively to activate the environment for only certain users. Complete documentation for the Web Interface product can be found in the Web Interface User’s Manual and Installation Guide Release 7.0.8 (DN1001038.1097).

## Error Messages

None

# NF630: Querying Which PTFs Have Been Applied for a Specific Release

By issuing a command at the FOCUS prompt, you are able to view a list of ptfs that have been applied to the version of FOCUS you are currently using.

## Example Querying the PTFs

```
? ptf
```

## Example Using the ? PTF Command

The following displays a screen containing the entering of the ? ptf command, followed by a sample result to the query.

```
FOCUS 7.0.8 10/20/1997 11.44.11 9999.01
>
? ptf
PTFS APPLIED TO RELEASE 7.0.8
FROM PTFABLE LOCATED IN FOCLIB LOADLIB F
```

| COUNT | PTF NUM | CREATED  | APPLIED  |
|-------|---------|----------|----------|
| 1)    | 12345   | 19970403 | 19971020 |
| 2)    | 12444   | 19970702 | 19971020 |
| 3)    | 12499   | 19970808 | 19971020 |

## NF631: Extended Plists

VM FOCUS now issues commands to CMS using CMS's 'Extended Plist'. This will enable FOCUS users to issue CMS commands such as STORMAP and PIPE that require the extended plist. It will also enable FOCUS users to specify FILEDEF, ACCESS and other CMS commands with parameters that are longer than eight characters.

### Usage

The standard plist or tokenized plist uppercases each token, left-justifies it, and truncates it to a length of 8 bytes. Extended plist has no limit on the length of the plist passed.

### Syntax

N/A

### Reference Examples

Without extended plist the command:

```
FILEDEF MINE DSN TEST.SAMPLE.MAY
```

would read as:

```
FILEDEF
MINE
DSN
TEST.SAM
```

In this case the Data Set Name has lost the 'PLE.MAY' part of the qualifier. A tokenized plist is limited to 32 tokens, each of which may be between 1 and 8 bytes. The extended plist consists of a control block that points to an uppercase command token, a pointer to the start of the option list, and a pointer to the end of the option list. The option list is left unchanged. Using extended plist with the previous example, would pass the following:

```
FILEDEF
MINE DSN TEST.SAMPLE.MAY
```

With extended plist, all of the Data Set Name is preserved.

### Reference Special Considerations

FOCUS uses a FILEDEF for SYSIN to read from the terminal and from FOCEXECs. By default FILEDEF uppercases all data. Reissuing FILEDEF with the LOWCASE option, allows a lowercase option list to be passed to VM. This requires all FOCUS commands to be typed in uppercase. This may be used for special cases when a lowercase plist is required

### Error Messages

N/A

## NF640: Dynamic Language Environment (LE) Support

IBM's recommended platform for high-level language products is known as Language Environment for VM and MVS. It provides a unified platform for runtime services used by LE supported languages. FOCUS user-written subroutines can now be linked using IBM's LE environment. LE support is available for both the MVS and VM operating systems.

This feature enhances our currently announced support for IBM Language Environment. It incorporates the automatic pre-initialization of a Language Environment Enclave or Sub-Enclave as required. This allows customer written HLL subroutines that were linked with LE libraries to run most efficiently. The implementation also allows non-LE-linked subroutines to run as well. FOCUS determines the characteristics of these subroutines and invokes them using LE interface module CEEPIPI if they are LE linked or in the traditional manner if they are not.

### Usage

All standard FOCUS subroutines, whether linked prior to LE or using the LE single runtime library are supported depending on Language Environment restrictions. Existing FOCUS subroutine libraries need not be recompiled and relinked unless your site converts to a single run-time library.

### Reference Special Considerations

Refer to IBM manual , SC28-1944 *Language Environment for OS/390 and VM Run-Time Migration Guide*, for instructions on how to use this environment and conversion limitations.

## NF642: Increased DEFINE Limitation

The limit of 256 for the number of DEFINES allowed in FOCUS has been removed. The limit now is dependent on the amount of memory available. The number of fields, both real and defined that can be referenced in a single request is still 256. It is possible to define as many fields as you need, as long as you have enough memory and the total number of fields referenced in a request is no more than 256.

## NF645: WEBHOME

FOCUS 7.0.8 introduces the Web Interface feature 'WEBHOME' which enables Web application developers to specify execution of a default FOCEXEC procedure in situations where FOCUS would normally return to command level. This allows them to prevent application users from accidentally or intentionally accessing command level FOCUS from within a Web application. Previously, FOCUS always displayed the 'FOCUS Interactive' screen by default whenever a Web Interface user entered FOCUS or after they ran a drill-down report or graph that cleared FOCSTACK. With this feature, developers can now display a menu or form that they choose, instead of returning to the FOCUS command level. This will ensure that the FOCUS application environment remains intact and consistent even when Web applications include drill-downs and/or allow users to access the ad hoc Java report and graph generation tools.

WEBHOME is activated via a FOCUS SET command that you can specify globally for a FOCUS session or issue in a FOCEXEC for a specific application.

### Syntax Identifying a FOCEXEC to Run Automatically

```
SET WEBHOME= {focexecname | OFF}
```

where:

*focexecname*

Is the 1 to 8-character filename of the FOCEXEC to be called instead of returning to the FOCUS command level and displaying the FOCUS Interactive screen

In CMS FOCUS, the focexecname must have a filetype of FOCEXEC.

In MVS FOCUS (TSO or MSO) the FOCEXEC must be a member of a partitioned dataset allocated to ddname FOCEXEC.



### OFF

The default, OFF, disables WEBHOME and restores the default behavior - the FOCUS Interactive screen is displayed whenever FOCUS returns to command level.

## Example Automatically Running a FOCEXEC

```
SET WEBHOME=APPMENU1
```

The above SET command causes the FOCEXEC named APPMENU1 to be called each time FOCUS would normally return to command level.

## Reference Special Consideration

This SET command is valid only in the Web Interface environment. It has no effect in a standard FOCUS 3270 session.

## Error Messages

*This SET command only valid in Web Interface Environment.*

## NF647: Extended Support for Scandinavian External Sort

FOCUS supports external sort with the Scandinavian National Languages Character set, and is able to pass the sort sequences for Swedish , Danish, Finnish, and Norwegian to the external sorting products. To specify the National Language Support Environment, use the LANG parameter as described in Section 21 of the FOCUS 7.0 Users Manual.

## Project 2000 - Phase III

The third phase of our year 2000 project for FOCUS includes rewritten user subroutines which perform date manipulations. They are: AYMD, AYM, YM, CHGDAT, GREGDT, JULDAT, DAXxx, DTxxx and FOCUS functions YMD,DMY,MDY. These subroutines and functions will now allow for century digit interpretation via the DEFCENT and YRTHRESH FOCUS settings. Date calculations for these subroutines may now extend beyond year 1999. The subroutines have also been enhanced to respect the last argument which may contain the output format from the subroutine.

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NF746 Leading Zeros  
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NF691 Escape Character for LIKE

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NF605 Date Handling for the Year 2000 in FOCUS

NF620 Year 2000 Subroutines

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- NF655 FOCPROF - The System Wide Profile
- NF656 Controlling REBUILD Messages
- NF670 DYNAM Support for Unit Count
- NF718 DYNAM Support for Existing Relative GDG Numbers
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- NF696 Calling Subroutines Written in REXX
- NF750 DATASET in a Master File
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- NF796 Unlimited Nested -INCLUDE Commands
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DB2 Interface SET ISOLATION Command

Default Space Allocation Table for Work Files

Dynamic Language Environment (LE) Support

EDA/MSO Console Display for IMS PSB

Expanding Byte Precision for COUNT and LIST

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DYNAM Support for Unit Count

Dynamically Setting the IDMS DBNAME and DICTNAME

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**FOCPROF - The System Wide Profile**

**FOCUS Client DNS Names Support**

**Fusion**

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**HOLD From External Sort**

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- Partitioned FOCUS Data Sources
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- Reporting From Independent Paths
- The Adabas Write Data Adapter for FOCUS
- Token Delimited Files
- Two-Gigabyte FOCUS Database Support
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- Creating Comma-Delimited Files
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- Displaying Fractions
- Exit on Error
- Extended Currency Symbol Support
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- LMF Site Code Warning Message
- Long Alphanumeric Fields
- Long Master File Names
- Reusable MSO/CICS Control Blocks
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**New Features: FOCUS 7.2 (*continued*)**

**SQL Support for Date-Time Formats**

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**Unlimited Nested -INCLUDE Commands**

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NF617 Automatic Allocation of FOCUS Files

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NF597 Aggregation by External Sort

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